

Discussion Paper 1 September 2012

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Violent Disorder in Ciudad Juarez: A Spatial Analysis of Homicide

Carlos Vilalta and Robert Muggah

Abstract

This HASOW Discussion Paper considers how demographic and socioeconomic factors correlate with homicidal violence in the context of Mexico's "war on drugs". We draw on Ciudad Juarez as a case study and social disorganization theory as an organizing framework. Social disorganization is expected to produce higher levels of homicidal violence. And while evidence detects several social disorganization factors associated with homicidal violence in Ciudad Juarez not all relationships appear as predicted by the theory. Drawing on public census and crime data, our statistical assessment detects 6 significant variables (or risks) positively associated with homicidal violence in Ciudad Juarez between 2009 and 2010. Likewise, the assessment finds 6 specific variables (or protective factors) that are negatively associated with above average homicide in the city between 2009 and 2010. The data and level of analysis do not conclusively present causation, nor was this the intent. Rather, we propose a baseline model for testing spatial-temporal dynamics of organized violence.

Introduction

Latin America and the Caribbean – indeed much of the world – is going through an unprecedented period of urbanization. Much of this urban growth is occurring not in upper-income settings but rather in the expanding cities and slums of lower- and middle-income countries. And many of the fastest growing metropolises are also witnessing a sharp escalation in the incidence and severity of urban violence.¹ There is growing acknowledgment about the ways in which the urban poor are directly and indirectly implicated in such violence and the wider consequences of violence in cities for national and regional stability more generally.²

One of the most disconcerting concentrations of urban violence in contemporary Latin America is in Mexico An obvious manifestation of urban violence is the physical and psychological harm against persons – from homicide to other forms of victimization. For more than a century social scientists have studied the ways in which such violence reconfigures social and spatial relations and triggers renewed cycles of insecurity spanning generations. For example, Bourdieu (1998) shows how "structural" forms of urban violence arising from the degradation of urban economies and austerity measures contributes to a "break down" in social life and new forms of violence. It is often symbolically and discursively apparent in protests, riots, disturbances, emergency declarations and insurgencies.³

One of the most disconcerting concentrations of urban violence in contemporary Latin America is in Mexico. In just over half a decade, Mexico's war on drugs has claimed almost 65,000 lives with most of these intentional deaths concentrated in northern states.⁴ Although the country's national homicide rate declined from roughly 19 per 100,000 to 9 per 100,000 between 1990 and 2007, it shot back up to previous levels by 2010, many intermediate cities in northern and eastern Mexico witnessed a surge to well above 150 homicides per 100,000. The escalation is linked to deployment of more than 60,000 soldiers by President Calderon since 2006 and an intensification of inter-cartel violence.⁵ What is especially unsettling is the appalling brutality and ritualized nature of violence, often intended to send messages to secure territory and influence.

The causes of organized criminal violence in Mexico are routinely distilled by to competition between rival factions of cartels, gangs and state security actors. Perpetrators are described as consisting of young males, influenced as they may be

³ Extending the symbolic to the physical, O'Neill and Rodgers (2012) recently introduced the concept of "infrastructural violence" in order to draw attention to the political economy shaping the social and geographic dimensions of urban violence and the implications for "spatially just cities."





¹ See UNODC (2011) and Muggah (2012).

² See Muggah (2012) and Muggah and Savage (2012).

by competition over transit routes. Victims are themselves narrowly cast as former criminals or unfortunate collateral damage. The deafening silence from the media and research community ensures that reporting on both causes and consequences of Mexico's drug war is periodic, uneven and circumspect.⁶ We contend, however, that a more robust examination of the correlates of organized violence is required to better understand means of minimizing and reducing it. And while the narrative of violent competition is necessary it is not sufficient. We argue that social disorganization appears to enhance the vulnerability of communities to organized violence.

This paper explains the dynamics of organized violence in Ciudad Juarez. The first section considers the theoretical parameters of social disorganization theory and explains its origins and implications for the design of our assessment of the correlates of organized violence. Section two considers the dynamics of organized violence and some of its attributed causes in Ciudad Juarez. Section three focuses in on the methods and data sources for determining the relationship between socio-economic factors (independent variables) and homicidal violence (dependent variables) in Ciudad Juarez. The fourth section examines the extent to which specific variables were positively or negatively correlated and detects a host of risk and protective factors. The paper closes with a short set of concluding reflections.

A more robust examination of the correlates of organized violence is required to better understand means of minimizing and reducing it

Social disorganization and violence

In order to fully understand the extent of Mexico's urban violence crisis it is necessary to reflect not just on its intensity and organization, but also to consider its geographic dimensions. Indeed, consideration of the geography of violent crime is hardly unprecedented. For decades, human geographers have investigated spatial aspects of criminal behavior and criminality (Georges, 1978). The field has a long and distinguished academic tradition that can be traced back to the nineteenth century (Lowman, 1986 and Muchembled, 2012). While not treated at length in this paper, the development of the field passed through three distinct stages:

- 1. the French cartographic school of the nineteenth century;
- 2. the Chicago ecological school of the early twentieth century; and
- 3. the more modern (and arguably international) so-called *school of the geography of crime* (Lowman, 1986).

A wide range of social scientists have contributed to the spatial study of violent crime. Prominent among them is the sociologist Max Weber who traced the evolution of order and violence in Western European cities in his 1921 volume, *The City.* Geographers and sociologists elaborated on his seminal work examining the interaction of contemporary of residents with the social and physical built environment of rapidly industrializing cities. A particular concern amongst these



⁶ See Newsweek (2012), Arsenault (2011), Booth (2010), Castillo (2010), Orrego (2010).

early scholars – and one addressed comprehensively by the aforementioned Chicago school – was the ways in which the built-up city – and in particular its rapid urbanization – negatively affected pre-existing individual bonds within communities. They discovered that social ties established through living in close proximity could be reconfigured by new forms of interaction favoring fluid market transactions over deeper kinship ties. These new relations were temporary, transitory and instrumental. Building on the findings of nineteenth century sociologist Emile Durkheim, proponents of the Chicago school noted how the progressive fraying of communal ties resulted in anomie and eventually a rise in neighborhood crime and criminal violence.

In analyzing demographic shifts within a single city, Chicago school affiliates detected a number of possible causal mechanisms shaping trends in criminal violence. As described above, one causal mechanism proposed was that rapid population growth contributed to social disorganization (Burgess, 1925). Related, *rapid population growth* also contributed to undermining the institutional capacity of public authorities and community entities to exert local social controls, especially in low-income and ethnically diverse communities (Shaw and McKay, 1942). These and other insights gave rise to the so-called "Theory of Social Disorganization", now widely used in contemporary criminological and geographical scholarship.



Figure 1. Social disorganization causes of crime: a selection of factors

Social disorganization theory is a macro-theory. It seeks to explain aggregated criminal behavior by focusing on the compositional and contextual characteristics of specific settings. Contemporary formulations of the theory suggest that it is not reservedly the ethnic composition of specific settings that are the principal drivers of neighborhood crime, but also the real and relative absence of social support networks, social capital, and the inability of communities to maintain collective action



(Morenoff et al 2001; Sampson et al 1997). Yet a number of key insights of scholars in the French and Chicago schools hold constant today in Mexico. Specifically, drugrelated and property crimes are highly spatially concentrated (Vilalta, 2010a, 2010b), as is the tendency of criminals to live close to areas where they operate (Vilalta, 2010b; Van Dijk, 1999; Singer, 1981). It is for this reason that certain city areas can be classified as "crime endemic" (Vilalta, 2010a; Eck and Weisburd, 1995).

There are competing explanations for what contributes to the causes of social disorganization and the spatial concentration of violent crime in so-called "hot spots" (see Figure 1). Certain scholars contend, for example, that there are typically areas within cities that offer more intrinsic opportunities for criminal activity owing to political neglect and the absence of state presence (Ackerman and Murray, 2004; Kubrin and Weitzer, 2003) together with local economic decay (Morenoff and Sampson, 2007; Ackerman, 1998, Sampson and Wilson, 1995). In the US, for example, some researchers have detected a correlation between the robbery of convenience stores and local rates of unemployment (Morenoff and Sampson, 2007; Ackerman, 1998).



Figure. 2 Social disorganization effects of crime: a selection of impacts

Other geographical findings of social disorganization link higher crime rates with areas exhibiting a higher density of offenders (Singer, 1981), a higher percentage of rental housing (Bottoms and Wiles, 1986), and large social housing projects (Block and Block, 1995). Likewise, the probability of becoming a criminal is also increased if the individual is raised in an area that traditionally experiences higher levels of crime (Krivo and Peterson, 1996). The attributed causal chain is that a higher density of criminals increases the chances of meeting accomplices due to wider network and closer communication between them (Reiss, 1986).



A considerable number of studies have also been conducted to determine the effects of social disorganization and associated criminal stains (see Figure 2). For example, Taub et al (1981) have found that increases in crime rates affect the housing market by lowering the value of homes. Similar assessments have also observed a negative spiral generated by the spatial concentration of criminal violence. For example, in affected areas there is often a decrease in the creation of new businesses, the outmigration of elite and business owners, a growing fear of crime and sense of hopelessness, a decline in the social reputation of the neighborhood, and eventually its depopulation (Muggah and Mulli, 2012, Morenoff and Sampson, 1997; Reiss, 1980). Less well understood, however, is how these different imputed causes are interconnected and reinforce (or negate) one another.

Violence in Ciudad Juarez

Although contemporarily known for spectacular levels of organized violence, Ciudad Juarez has historically been one of the key economic engines of Mexico. With a total estimated population of 1.3 million in 2012, and located in the border between the Mexican state of Chihuahua and the US state of Texas, it is home to a massive manufacturing base. Yet not unlike other Mexican cities bordering the US, Ciudad Juarez exhibits complex "social dichotomy" characteristics. Indeed, it has always experienced informal and often black-market forms of trans-border trade and socio-economic characteristics. During the US prohibition of the 1930s, for example, bars and clubs multiplied in the downtown area just across the border bridge of Juarez-El Paso contributing at the time to what was regarded as a form of social break-down.⁷

Ciudad Juarez has also long served as a "gateway" city. Literally millions of migrants have passed through its perimeter or stayed on as residents over the past half century (see Figure 3). Between 1942 and 1965 under the *Bracero* program, for example, hundreds of thousands of agricultural workers migrated to the US from Ciudad Juarez. By the time the program had ended the city ballooned to almost 400,000 inhabitants. The state and city's industrial policy was latterly redirected toward industrialization for the US consumer market including the recruitment of low-skilled labor, particularly women to work in *maquilas*.⁸ Unlike the Bracero program, however, the maquila initiative has continued to attract young workers – particularly women. It has also contributed to socially structuring effect, including the rapid growth of poorly serviced slums, sustained male unemployment, low-paid working mothers and children reared in single parent households.

Ciudad Juarez has also long served as a "gateway" city



⁷ In fact it is said that for many years the city raised most of its taxes from the legal distribution of alcohol (i.e. operating bars and nightclubs).

⁸ Indeed, maquiladora is the name given to factories that make products reservedly for foreign markets and do not pay for the imports of raw materials.



Figure 3. Ciudad Juarez: Total population and employed population: 1900 and 2010

Table 1. Ciudad Juarez: Total number of homicides linked to the war onorganized crime and individuals sentenced for a homicide crime between2006 and 2010

	Homicides linked to war on organized crime*	Individuals sentenced for homicide**
2007	136	79
2008	1,332	71
2009	2,230	58
2010	2,738	36
Total	6,436	244

Source: Data taken from INEGI 2012 and Presidency of the Republic 2010 *One homicide was recorded in December of 2006 when the war started. **Of which around 91 per cent where found guilty



Source: Data taken from INEGI 2012



Figure 4. State of Chihuahua and Ciudad Juarez: Total number of individuals sentenced for a homicide crime between 1994 and 2010

Source: Data taken from INEGI 2012

The effects of these two programs contributed to gradual process of social disorganization in Ciudad Juarez. The resultant chronic income vulnerability, repeated economic recessions and weak family structures laid the foundations for the onset of violence. The rapid spike in inter-cartel related violence served as the trigger. Today, Ciudad Juarez is one of the most violent cities on the planet. Between December of 2006 and December 2010, some 6,437 homicides were linked to the so-called war on organized crime (see Table 1) Between 1994 and 2010, however, just 1,792 individuals were sentenced for committing homicide. There is an extraordinary mismatch between homicides committed and sentenced individuals – indicating a dangerously high rate of impunity (see Figures 4 and 5).

It is important to stress that violence in Ciudad Juarez is highly organized. Indeed, it appears to be strongly correlated with organized crime and the so-called war on drugs. After 2006, Ciudad Juarez emerged as one of the most hotly disputed cities and transit points amongst competing drug cartels. Recent trends in homicidal violence are not random events or solely the effect of social disruption, including industrial policies and labor migration. Indeed, they can be traced in large part to the decision of the leader of *El Cartel de Sinaloa*, El Chapo Guzman, to take control of the city and displace the *Cartel de Juarez*. The shift in strategy was not only to



consolidate a hold over transit routes for moving drugs into the US but also to control local markets for the consumption of marijuana and cocaine.

Figure 5. State of Chihuahua and Ciudad Juarez: Total number of homicides linked to the war against Organized Crime between 2006 and 2010



Source: Data taken from Presidency of the Republic 2010

Methods and data

In order to identify options to prevent and reduce urban violence, we consider the underlying social and spatial dynamics of social disorganization and criminal violence in a single setting, Ciudad Juarez. The study draws on two primary data sources. The first includes demographic and socioeconomic data extracted from the Federal Electoral Institute (IFE) geo-database which includes 2010 census data.⁹ The second includes crime data drawn from the Federal Police (SSP) and features the number of homicides reported by the police. A spatial link between the IFE and Federal Police data was established with the use of ArcMap geographic information systems software. This allowed for the matching of IFE sections with SSP federal police sectors and districts (see Map 1). From a geographic perspective, the basic referent is the IFE section (n = 1,056).¹⁰ These discrete sections were matched with corresponding federal police districts (n = 9). Not all IFE sections belong to a federal police district: many IFE sections lie outside of them. For the purposes of this



⁹ Data available at: http://gaia.inegi.org.mx/geoelectoral/viewer.html.

¹⁰ The regression analysis only found 735 units with all the data necessary for modeling.

assessment, Ciudad Juarez is divided into 9 police districts and 157 federal police sectors.

Police District	Spatial units*	Population	
Aldama	145	100,878	
Babicora Norte	112	84,797	
Benito Juarez Norte	76	72,675	
Chihuahua Norte	113	96,077	
Cuauhtemoc	65	45,525	
Delicias	188	127,522	
Babicora Sur	106	81,840	
Chihuahua Sur	90	82,908	
Benito Juarez Sur	161	93,443	
Total	1,056	785,665	

Table 2. Population and spatial units per police District, 2010

Source: Own calculations based on IFE data.

*These refer to IFE electoral sections. There is a spatial mismatch between the IFE spatial units and federal police districts.

For the purposes of this study, the dependent variable is represented by below/above (1 = below the mean, 2 = above the mean) the arithmetic mean number of homicides per district (M = 169) recorded by the Federal Police between 2009 and 2010. IFE sections were classified as located within a "below the mean police sector" or "above the mean police sector" (see Table 2).¹¹ Other IFE sections within the city but outside federal police sectors were not included in the analysis. Meanwhile, the independent variables were a set of 209 demographic and socioeconomic continuous variables available from the IFE database.¹² Finally, the latitude (x coordinate) and longitude (y coordinate) of the spatial unit was included as a control. A visual inspection of the spatial distribution of violence reveals a clustering of homicides in just a small number of police sectors. To confirm the non-random nature of homicidal violence in Ciudad Juarez, a spatial autocorrelation analysis was conducted using Global Moran coefficients.



¹¹ Police sectors are are spatially larger and contain several IFE electoral sections.

¹² No categorical variables can be found in the database.

In order to test the strength of correlations, our framework was fitted using a logistic binary regression model. The analytical strategy included a regression analysis considering all the aforementioned 209 independent variables selecting the best descriptive model available. The approach utilized consisted of a Forward Selection Wald-statistics method, which selects the best model based on the significance of each variable score statistic and by removing superfluous correlations based on the probability of the Wald statistic. A p value of ≤ 0.10 was the cut-off level of significance. In this sense, the study adopts an exploratory approach. A Hosmer-Lemeshow test of goodness of fit for the model was included.

Findings

An initial analysis of the distribution of homicidal violence in Ciudad Juarez allowed for a determination of "hot spots" falling above the mean (see Table 3). As noted above, federal districts falling above and below the arithmetic mean were then to be correlated with the independent socioeconomic variables. The assessment thus sought to determine which compositional characteristics were associated with above or below-average numbers of homicidal violence in the city. As will be discussed below, a number of factors were positively correlated with low rates of violence while others were negatively associated.

Table 3. Total number of federal police report of homicides per police district,2009 and 2010

Police District	Federal police homicide reports	Classification
Delicias	314	Above the average
Aldama	271	Above the average
Babicora Sur	219	Above the average
Benito Juarez Sur	155	Below the average
Benito Juarez Norte	146	Below the average
Babicora Norte	144	Below the average
Chihuahua Norte	94	Below the average
Chihuahua Sur	88	Below the average
Cuauhtemoc	87	Below the average
Total	1,518	-

Source: Own calculations based on IFE data.







Map 1. Federal police districts and police sectors and total number of reported homicides between 2009 and 2010

Source: authors reconstruction of SSP and IFE data

Map 2. Federal police districts, police sector, IFE sections and total number of reported homicides per police sector between 2009 and 2010



Source: authors reconstruction of SSP and IFE data





Map3. Federal police districts and police sectors above/below the mean of reported homicides between 2009 and 2010

The maps above indicate a strong clustering of homicides in a small selection of police sectors and districts. Prior to the analysis of the social composition of police districts, then, a spatial autocorrelation test was conducted on the number of homicides per police sector. It is important to recall that the 9 federal police districts in Ciudad Juarez are subdivided into 157 police sectors. The results of the test are featured in Table 4 and confirm non-random clustering of homicides for every year and during the entire period.¹³ However, between 2009 and 2010, there was a decrease in the magnitude of the coefficients, suggesting a process of spatial deconcentration of homicidal violence from one year to another.¹⁴

Table 4. Results of Spatial Autocorrelation Analysis

Variable	Moran's I coefficients*,**	Interpretation
Homicides in 2009	0.098 (0.001)	Spatial clustering
Homicides in 2010	0.078 (0.001)	Spatial clustering
Homicides in 2009 and 2010	0.112 (0.001)	Spatial clustering

*Significance in parentheses

**Coefficients were calculated based on an Inverse Distance Squared function

Central to assessing the relationship between social disorganization and violence is a careful determination of the demographic and socioeconomic composition of

¹³ Spatial autocorrelation coefficients were obtained for each year and for the entire period.



¹⁴ It must be said that the federal police started collecting these data in 2009. As such, it is expected that their data collection processes would improve over time independently of the internal homicide dynamics.

Source: authors reconstruction of SSP data

the above-average violent districts. Due to the large number of independent variables available for analysis, a stepwise selection method was applied for fitting the best model to the data. The resulting binary logistic regression model was able to detect 12 significant variables (apart of the 2 control variables, one being the latitude and the other the longitude; "x" and "y" coordinates respectively) or factors associated with homicidal violence in Ciudad Juarez between 2009 and 2010. The factors are listed in Table 5. Most of these factors are consistent with social disorganization theory and account for a good amount of variance (Nagelkerke's pseudo R-square = 0.724.). In the regression equation used to predict homicidal violence, seven factors were significant at 0.01 per cent level, five factors were significant at 0.05 per cent level, and one factor was significant at 0.10 per cent level. The constant or intercept of the resulting equation was also statistically significant, meaning that homicidal violence will still occur independently of the value of the socioeconomic factors included in this model.

	В	S.E.	Wald Sig.	Exp(B)
Population born in another state	0.031	0.004	0.001	1.032
Female population between 6 and 11 that do not attend school	-0.274	0.112	0.014	0.760
Population above 15 with more than 9 years of schooling	0.030	0.008	0.001	1.031
Average schooling among male population	0.540	0.146	0.001	1.716
Population with employment	-0.016	0.006	0.013	0.985
Population ascribed to the ISSSTE social security	0.015	0.007	0.038	1.015
Population ascribed to Seguro Popular	-0.023	0.005	0.001	0.978
Population over 12 that is married	-0.015	0.006	0.016	0.985
Vacant housing	0.012	0.005	0.029	1.012
Temporary housing	-0.081	0.025	0.001	0.923
Occupied home units with land floor	-0.079	0.041	0.052	0.924
Occupied home units with no access to water inside the premises	0.121	0.032	0.001	1.129
X coordinate	-39.361	6.033	0.001	0.000
Y coordinate	34.654	5.963	0.001	0.000
Constant	-5291.858	569.622	0.001	0.000

Table !	5.	Results	of	Binary	Logistic	Regression
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Diagnostics:

Chi-Square = 571.295, p < 0.000

Nagelkerke's pseudo R-square = 0.724. Hosmer and Lemershow Chi-square test = 13.779, p = 0.088

Percentage correctly predicted: 87.1%

*Dependent variable: Homicides (reported in the federal police reports between 2009 and 2010). Responses: 1 = below the mean, 2 = above the mean. Sample size = 735 The assessment determined a range of variables that are related to homicidal violence. Aside the two geographic variables (i.e. the x and y coordinates), there are at least 12 statistically significant underlying demographic and socioeconomic factors that correlate with the above-average incidence of criminal violence in Ciudad Juarez (see Table 3). Many of these "risks" are reported in other settings and include low levels of employment, low access to social security, vacant and inadequate housing, low levels of education and migration. In other words, there are signs that areas characterized by urban poverty and marked deterioration are also susceptible to disproportionately high risks of homicidal violence.¹⁵ Others are more "protective" and are linked to higher rates of education, social cohesion and education.

Risk factors

The assessment detected 6 specific factors that appear to be robustly associated with high rates of homicidal violence (see Figure 6). These demographic and socioeconomic factors include population born in another state, population above 15 with more than 9 years of schooling, average schooling among male population, population registered to ISSSTE social security services, vacant housing, and occupied home units with no access to water inside its premises. Some of these variables are intuitive and correspond with the apparently directed forms of violence along Mexico's border with the United States. Yet as we shall see below, others are more counterintuitive. Most important for the purposes of this paper, many are predicted by social disorganization theory.

At the outset, the factor "population born in another state" is conceptually related to the basic premise of social disorganization theory. Theory predicts that newly arrived or migrating populations tend to have more difficulty in developing bridging, binding and associative networks and maintaining collective action in their (new) areas of residence. Likewise, social disorganization theory predicts that areas with high concentrations of migrant population tend to suffer from political oversight and neglect.¹⁶ Indeed, the targeting and massacring of migrant populations in Mexico is testament to this theory. There is a clear case to be made, then, for concentrating violence prevention efforts on out-of-state migrant populations who are especially vulnerable to victimization.

The assessment also finds that police districts with higher numbers of populations (15+ years old) with more than 9 years of schooling also exhibit higher numbers

¹⁶ If political oversight and collective efficacy were not measured in this study, still we find that above the average levels of homicidal violence were reported in police districts with higher levels of out-state residents.



¹⁵ This is a finding routinely reported by public health specialists, for example, who employ the so-called "ecological model" to understanding risks in relation to self-directed, interpersonal, collective and structural violence.

of homicidal violence. In Mexico, this implies at least one year of high school. The spatial mismatch between what is expected in theory (higher rates of education equaling lower rates of violence) can be attributed to a number of factors within and outside of social disorganization theory. Actually, a tragic fact of Mexico's current situation is that while some information may be known about where incidents take place, much less is recorded or made available on who committed crimes.¹⁷ Clearly more research on the profile of perpetrators and victims is required.¹⁸



Figure 6. Cd. Juarez: Factors that propel urban homicidal violence



It is also important to stress that the factor "the average schooling among male populations" was also positively correlated with homicidal violence. Put succinctly, police districts featuring higher levels of schooling among male residents tended also to report higher numbers of homicidal violence. It is important again to recall that the average level of education refers to 9 years – the equivalent of completion to a single year of secondary education. Indeed, this level of education is high when compared to the national average. As noted above, it is difficult to interpret this finding in the absence of more information on the perpetrators. Nevertheless, statistically speaking, more homicides were committed in areas where the male population was comparatively better educated.

¹⁸ Indeed, a recent study on the profile of inmates in federal prisons found significantly higher proportions of married, college degrees, and college educated inmates among those convicted for murder (Vilalta, 2012).



¹⁷ What we know is the number of homicides reports and the demographic and socioeconomic composition of the police district.

Another unexpected finding relates to the supposedly negative relationship between a specific welfare benefit and the above average incidence of homicidal violence in Ciudad Juarez. Specifically, the variable "population registered in the ISSSTE system of social security" was also high in more problematic – or high homicide affected – police districts. The ISSSTE refers to the Institute for Social Security and Services for State Workers. It was founded in 1959 for the benefit of federal government employees and provides health services and pension benefits. Once again, using the proxy of social welfare – we observe higher levels of homicidal violence in ostensibly "middle class" police districts. And yet the available evidence emerging from previous studies suggests that lower status population groups are more likely exposed to homicide than those in middle and upper strata (Ellis et al 2009).

Vacant housing and occupied homes with no access to water inside the premises were correlated with disproportionately high violence The final factors related to housing were also positively correlated to above average homicidal violence. Specifically, "vacant housing" and "occupied home units with no access to water inside the premises" were correlated with disproportionately high violence. The first factor was already identified as a classic social disorganization factor. Neighborhood physical conditions have also been associated elsewhere in Mexico with crime and fear of crime (Vilalta, 2009, 2010c). The causal mechanism here appears to be that large numbers of vacant housing denote an absence of guardianship, thus propelling social disorder and criminal violence. Likewise, it might also be an effect of social disorder and crime.

On the other hand, housing units with no access to water serves as a proxy of economic deprivation. Typically these types of housing units can be found in peripheral areas of the city which have been recently occupied by newer and poor residents. This is in contrast to the factor of "occupied housing units with no cemented floors" which correlated negatively with homicidal violence. As such, this apparent contradiction requires further analysis which is beyond the scope of the present paper.

Finally the two geographical controls, namely the latitude and the longitude, were able to statistically predict what was already observed from the map. Namely, that between 2009 and 2010 homicidal violence was concentrated predominantly in the northwestern and western police districts of the city. If latitude and longitude were used to predict homicidal violence, it is very likely that we could have seen higher levels of homicidal violence in those police districts again in 2011.

Protective factors

As noted above, there are at least 6 socioeconomic factors that negatively correlate with criminal violence in Ciudad Juarez (see Figure 7). These "protective factors" include female population between 6 and 11 years old that do not go to school, populations exhibiting employment, populations registered to the social program



Seguro Popular, populations over 12 that are married, the prevalence of temporary housing, and occupied home units with no cemented floors. Put another way, reported homicide was lower, on average, in police districts exhibiting higher incidence of these factors.

There are a number of possible explanations for the above mentioned "protective" factors. Indeed, the extent of female population between 6 to 11 *not* attending school appears at first sight to be contradictory. Notwithstanding the (negative) implication of truancy or delinquency, it is nevertheless negatively correlated to homicidal violence between 2009 and 2010. Yet in the Mexican context, this factor may simultaneously represent a level of family support to the household, in this case support provided by female children. It thus constitutes an economic need spatially matched to the deterrence of homicide. And while negatively correlated, the withholding of girl children from school hardly constitutes a valid crime prevention strategy.



Figure 7. Cd. Juarez: Factors that deter urban homicidal violence

Source: Reconstructed from RLP results. The circle sizes represent the importance of each factor in predicting reduced homicide rates.

A more common crime prevention strategy relates to the purposive employment of populations in high risk areas. Indeed, as signaled above, the extent of the population that is employed featured a negative correlation with homicidal violence. Certainly, police districts featuring higher levels of employed populations presented lower than average homicide rates between 2009 and 2010. In the meantime, the opposite phenomenon, that is a positive relationship between unemployment and increases in homicidal violence, was also demonstrated in this assessment and in statistical studies elsewhere (Restrepo and Muggah, 2012; Preti and Miotto, 1999). As such, employment not only increases family income and generates wide socioeconomic and socio-behavioral dividends, but it seems to successfully prevent



homicide from occurring in selected districts. Still, while districts with large numbers of employed populations appear to deter extreme violence - it is important to recall that most jobs are low-wage and connected to *maquiladoras*.

Likewise, there is evidence that investments in social welfare programs also appears to protect individuals from homicidal violence. Specifically, the independent variable "population registered to the social program *Seguro Popular*" supports the assumption that specific public interventions designed to improve social wellbeing and population health have a preventive effect. *Seguro Popular* is a federal program that provides free and subsidized access to medical, pharmaceutical and hospital services for the general population. It is useful to note that approximately 11 per cent of the city's residents in 2010 were registered to *Seguro Popular*.¹⁹ Although it is not the public health program in the city, there is nonetheless preliminary evidence that it constitutes a protective factor.

There is evidence that investments in social welfare programs also appears to protect individuals from homicidal violence There is also support for the importance of social ties – and in particular marriage – in reducing exposure to homicidal violence. The variable "population over 12 that is married" is a proxy of family cohesion and appears to serve as a protective factor. Married individuals may have a lower propensity to violence as they belong to a family unit that provides a wide range of support functions – economic, socio-cultural, emotional, and otherwise. It may in fact be easier to develop community support networks, social capital, and collective efficacy based on family units rather than more dispersed and isolated referents.

Another puzzling finding relates to the apparently protective functions of privately owned temporary housing units. This particular relationship does not appear to support the theory of social disorganization. Indeed, temporarily owned housing units are defined in the census as vacation homes used a few days a year lacking permanent residents and clear economic functions. They are not the same as vacant units (which are positively associated with homicidal violence).²⁰ It is not clear, then, whether these temporary units are indicative of more or less social organization even if police districts in Ciudad Juarez exhibiting proportionately more rates of vacation housing also experience lower than average homicidal violence.

The last variable negatively associated with homicidal violence is also a "housing" factor: occupied housing units with no cemented floors. This factor is also indicative of economic deprivation. Indeed, houses lacking permanent floors tend also to

²⁰ A correlation analysis conducted after showed that more privately owned temporary housing units could be found in areas with more vacant housing units, housing units with no drainage, and with larger numbers of male population with higher levels of schooling.



¹⁹ According to the 2010 Census, the Mexican Institute of Social Security (IMSS) is the largest public health program covering approximately half of the city's residents. It is directed to workers and their families in the private formal sector.

be occupied by disproportionately lower income households. Certainly, it also positively correlates with other variables predicting poor housing conditions such as housing units with only 1 room, no drainage, no electricity, and no access to water inside its premises. In other words, this factor represents the poorest areas of the city. As with the factor above, we found a spatial mismatch between extreme poor housing and poverty with homicidal violence. A spatial mismatch happens when two geographically aggregated variables correlate negatively. In this case, districts with higher numbers of occupied housing units with no cemented floors also had lower numbers of homicides reported by the federal police.

Conclusions

In order to develop a more sophisticated set of responses to preventing and reducing organized violence in settings such as Ciudad Juarez it is essential to better understand its underlying causes. Policy makers and their electorates are easily susceptible to narrowly conceived and heavy-handed responses. When reliable and valid information is often missing, it is natural that responses often treat perpetrators and victims in dichotomous boxes. Yet a closer reading of the underlying social conditions of specific urban settings and the spatial dynamics of homicidal violence reveal a more expansive range of alternative entry-points.

The evidence presented in this initial study reveals that homicidal violence is not only highly spatially clustered but that it is also correlated with a number of compositional variables or social factors. Specifically, we detected a set of underlying risk factors and protective factors operating in Ciudad Juarez between 2009 and 2010. A starting point was that social disorganization correlates with violence and this premise was partially confirmed, albeit with some unexpected relationships. There are multiple explanations for both the expected and unexpected outcomes, two of which are highlighted below.

Social disorganization theory may require more country or city-specific conceptualizations and measurement tools. While the theoretical logic may apply, the concepts and methods may require more subtle testing in border cities experiencing extreme forms of violence. Indeed, signs of disorganization in one setting may not be the same as in others. For instance, the fact that female children do not attend school may signal a form of social injustice, but it may also serve a crucial family function – including substituting for income and livelihoods while mothers are working. Such family support may in turn translate into less homicidal violence as appears to have been the case in Ciudad Juarez.²¹

Another potential explanation for the unexpected relationships detected in the data



²¹ It is worth noting that such Family variables (as protective factors) have been noted in other studies on criminal violence in Mexico. See, for example, Vilalta and Fondevila (2012).

Homicidal violence is not only highly spatially clustered but is also correlated with a number of social factors The opportunity for extreme violence may in fact have been dormant in the existing social and morphological constitution of Ciudad Juarez above is the unanticipated explosion of homicidal violence from 2006 onwards. The opportunity for extreme violence may in fact have been dormant in the existing social and morphological constitution of Ciudad Juarez. As noted above, what may have been lacking was a trigger in the form of a declaration of a cartel war. There is in fact no record in Mexican history of an analogous explosion of homicidal violence in a situation other than war. The war of independence and the Mexican revolution were, of course, wars in the classic sense. As such, ad hoc predictors of homicide may also be included in the Ciudad Juarez model as a contextual and causal factor for local social disorganization. Such unique events probably demand a wider study beyond demographic and socioeconomic composition variables.



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The Humanitarian Action in Situations other than War (HASOW) project is based at the International Relations Institute of the Catholic University of Rio de Janeiro (IRI-PUC) with support from the International Development Research Centre (IDRC). The aim of HASOW is to comprehensively assess the dynamics of urban violence and the changing face of humanitarian action. Administered between 2011 and 2013, HASOW focuses on the dynamics of organized violence in urban settings, including Rio de Janeiro, Ciudad Juarez, Medellin and Port-au-Prince.

Coordinators

Robert Muggah Paulo Esteves

Designer

Kenia Ribeiro Photography & Graphic Design

Address

Rua Marquês de São Vicente, 225, Vila dos Diretórios, casa 20 Gávea, Rio de Janeiro - RJ Brazil

Contact

(55) 21 2245-1900 contacto@hasow.org <u>www.h</u>asow.org







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