

Illegal Drug Markets: The Geographic Perspective and Crime Propensity

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Abstract: *The geographic perspective argues that customers must be accessible to the drug market's location for an illegal drug market to be sustained. Previous research illustrates that geographic and economic principles are key explanatory variables of the locations of illegal drug markets. The current study explores this assumption through an examination of drug sales arrests in Portland, Oregon from 1990 through 1998. Growth curve modeling is used to explore changes in patterns of drug sales arrests while controlling for drug free zones, natural change over time, police officer allocation, population, and crime propensity (spatial autocorrelation). The findings of this research indicate a strong effect of crime propensity but a non-significant statistical effect for drug free zones on explaining the potential locations of drug markets.*

Keywords: drug free zones, geography of crime, drug crimes, Portland, OR, offender decision making, policing

Research demonstrates that illegal drug markets are spatially concentrated in certain parts of metropolitan areas (Rengert et al., 2000; Weisburd and Green, 1995). There is less agreement as to why these places become drug dealing hot spots. One set of arguments reasons that drug market locations are determined by the social and economic status of neighborhoods (Davis et. al., 1993; Harrell and Peterson, 1992). The lower the social and economic status of the neighborhood, the more likely it is to be socially disorganized (Shaw and McKay, 1969; Robinson, 2003). In turn, community residents' ability to prevent the incursion of illegal drug dealers is reduced. According to Skogan (1990), social and economic disorder also leads to the deterioration of the built environment which, in turn, signals illegal drug dealers that residents are not likely to interfere with their illegal activities (Wilson and Kelling, 1982).

Another set of arguments focuses upon the geographic nature of the environment. The number and location of potential customers, the accessibility of the drug market, and "cues" used by offenders to locate suitable targets are among explanations of crime location proffered by the geographic perspective. In other words, according to the geographic perspective, customers must be accessible to the market's location for an illegal drug market to be sustained (Hough and Edmunds, 1997; Rengert, 1996). The geographic perspective considers the relative number of customers accessible to a place in the explanation of drug dealing hot spots (Rengert et. al. 2000). The lower the social and economic status of a community and the

more deteriorated the housing stock, the more abandoned homes are likely to exist in the community and the fewer potential customers there are likely to be for an illegal drug market. As Hough and Edmunds (1997) illustrate, a threshold of potential customers must exist within the range of an illegal drug market place for it to remain in business. Rengert et al. (2000) illustrate that these geographic and economic principles take precedence over sociological ones. In fact, they discovered that when urban communities enter the lowest social and economic status, illegal drug markets are not likely to appear unless they are positioned spatially near a major highway to take advantage of nonresidential commuter customers.

This study explores whether measures of accessibility and customer location that are associated with the geographic perspective were related to changes in drug sales arrests in Portland, Oregon from 1990 through 1998. A second question addressed by this study is whether increased sanctions associated with drug free zones in Portland were effective in decreasing drug sales arrests after other geographic factors are controlled for.

The Geographic Perspective

Overall, sociological and geographic explanations highlight the fact that all communities in a city are not equal with respect to locational attributes for an illegal drug market. According to a more sociological perspective, some communities are more socially disorganized than others and are, therefore, less capable of resisting an

incurion of illegal drug dealers. According to a more geographic perspective, some communities contain more potential customers and/or are located near where regional customers enter the city and, thus, have geographic and economic advantages for selling illegal drugs.

In the latter case, if local authorities such as the police are successful in removing illegal drug dealers from a geographically “advantaged” community, there will be considerable incentive on the part of the illegal drug dealers to return and reestablish their market, since this is the best location to maximize their profits. In other words, police actions may be successful in moving them from their chosen location to sell illegal drugs. Their activities, therefore, are spatially displaced to a second or third best location. However, the desire on the part of a rational illegal drug dealer is to return to the best location to sell illegal drugs. Therefore, the spatial displacement of illegal drug dealers is much like stretching a rubber band anchored at a best location to sell illegal drugs. Once you release the rubber band, it snaps back to its previous anchored location. Likewise, as soon as the police activity ceases, illegal drug dealers will attempt to snap back to the best-advantaged locations from which they were removed..

Community residents are aware of this likelihood. On Monday, May 1, 2002, for example, the Philadelphia police initiated “Operation Safe Streets.” They stationed a police officer at 229 of the most active drug dealing corners in the city (Moran, Fleming and Salisbury, 2002). Nearly everyone recognizes that the police department cannot afford to station a police officer on 229 corners forever. Therefore, when the police move to another location, the drug dealers are likely to return (snap back) to the best corners to sell illegal drugs. A local resident was quoted by Moran, Fleming and Salisbury (2002) as saying:

This is just for the moment....As soon as those cop cars pull away, it's going to be back to usual. I'm glad to see the police here, but it's only temporary. You need something permanent. (p. B3).

Clearly, something more than a police officer temporarily stationed on a corner is required to permanently rid a neighborhood of illegal drug dealers. Often, however, this is the only action taken. The question turns on whether a geographic perspective may add further understanding of this persistent problem.

There are three categories of techniques with a geographic focus used to address problems of illegal drug

markets: 1) “hot spot” identification and focused policing; 2) legal sanctions associated with “drug free zones;” and 3) combination of police action and legal sanctions. We begin with a discussion of the development of “hot spot” policing.

Hot Spot Identification and Police Action

Hot spot or hot area analysis is well established in the literature dating back to the identification of “Rookeries” of crime in 18th century England (Tobias, 1969). These areas were to be avoided in order not to fall victim to a criminal. More recently, Schuerman and Kobrin (1986) identified “persistent high crime neighborhoods.” These authors argued that there was little public officials could do about crime in these communities, since they would not gain the support of residents. Shuerman and Kobrin (1986) argued that such neighborhoods should be written off and that police should concentrate on the “tipping point” communities surrounding persistent high crime communities that had not yet experienced high levels of crime over many years. Such a policy was termed “containment policy,” since the attempt was to spatially contain the persistent high crime communities (Rengert, 1996).

Since the use of a containment policy ignores the highest crime areas that coincidentally may be the best locations for selling illegal drugs, it follows that the energy driving illegal drug markets (profits) remains unaddressed. Containment areas, therefore, begin a predictable outward diffusion of drug sales and crime in a contagious fashion (Rengert, 1996). The practice of containment was doomed to failure as containment areas failed to be contained and major parts of our largest cities (Bronx, New York, South Central Los Angeles, East Central Chicago and the Bad Lands of Philadelphia) drifted into what became persistent high crime areas.

Hot spot policing and the use of computer crime mapping offered an alternative to containment policy. In fact, the reasoning involved was almost the reverse of containment policy. Rather than “writing off” the persistent high crime communities in the form of an urban triage, computer mapping identified these areas as hot spots and allowed administrators to focus police resources. Police resources are focused on the worst crime areas whether or not the police experienced cooperation from the residents. In other words, hot spot policing uses crackdowns, sweeps, and other focused methods to remove criminals, such as illegal drug dealers, from the most crime-ridden communities in the city. Rather than “circling the wagons,” as was advocated in containment

policy, hot spot policing intends to take the criminal heart out of a crime-ridden community, with or without the cooperation of the residents.

Alphabet City in New York is an early example of success using these techniques to identify a drug infested community and focusing police attention on it. Police removed drug dealers from this community making it a more desirable place for upper income residents to live. However, due to the snap back tendency of illegal drug dealers to return to the best locations to sell illegal drugs once the police leave a swept area, the dealers return. This is why the new residents of Alphabet City resisted the redeployment of police who had flooded their community even after the drug dealers had left and crime was under control. They wanted the police to continue their crime control function at this elevated level, even though crime was down. Perhaps the community residents should have contributed more to the effort at this point.

Once a police sweep has ended, the responsibility for maintaining a community within which drug dealers are not welcome lies with the local residents. An example of a program of this type is called “weed and seed.” Police sweeps are used to rid (weed) the community of drug dealers, and community empowerment (seed) is developed to resist their return. Sometimes neighbors are taught methods of confronting drug dealers while other times coproduction activities with the local police are fostered. In the latter case, something as simple as prioritizing calls for service that come from a weed and seed community can persuade residents that the police are taking their issues seriously, rather than writing them off in a containment policy. This renewed faith in the police alone can make a big difference in local residents’ attempts to resist the return of illegal drug dealers.

Weed and seed policies rely largely on the combined efforts of the police and the community. Therefore, this program is not particularly useful in parts of the city that do not contain many residents such as the central business district of a city. In these places, police must act without the aid of residents. Other criminal justice agencies, however, can be helpful to the maintenance of a drug free community from a geographic context. One example of a related criminal justice activity is the geographic delineation of areas in a city subject to enhanced legal sanctions—the enforcement of drug free zones.

Legal Sanctions Associated with Drug Free Zones

Public officials have deemed certain geographic sites so sensitive that they feel justified in going to extraordinary means to keep them safe. In these instances, citizens may

lose some constitutional rights when they enter these areas. Powers of search and seizure, for example, are increased at international borders where persons can be searched more thoroughly than inside a nation.

Public officials have decided that schools also are particularly sensitive sites, similar in nature to airports. The special protection from illegal drug use offered to schools in the United States is one example of how legislation has been enacted to allow special sanctions in specific places. A method of doing this is to establish a drug free zone within one thousand feet of a school. Anyone arrested for any drug crime within a school drug free zone is subject to double the regular legal sanction (Rengert and Chakravorty, 1995).

The doubling of a legal sanction is simply an increase in the amount of punishment meted out to the offender. Research has demonstrated that punishment is not always an effective deterrent to illegal activities. Piquero and Rengert (1999) demonstrated that active residential burglars focus more on potential gain than on potential punishment in their decision to commit a criminal act. Rengert and Chakravorty (1995) found that drug free school zones in central Philadelphia were not an effective deterrent to illegal drug dealers.

Rengert and Chakravorty (1995) hypothesized that the lack of support for the deterrent effect of drug free school zones in central Philadelphia may have been attributable to the fact that drug free school zones relied solely on the threat of serious punishment. There also was little of central Philadelphia not contained in a drug free zone. The result of the drug free zone legislation, in central Philadelphia, was the equivalent to an increase of the penalty for drug offenses across the board without any increase in the certainty of punishment. As shown by Piquero and Rengert (1999), however, the simple action of increasing the penalty does not reduce crime if offenders are more focused on rewards rather than punishment.

There is little consensus that increasing the severity of criminal sanctions alone can reduce criminal activity. For example, Marvell and Moody (1995) demonstrate that enhanced prison terms do not have a long term effect on the rate of felonies committed with guns. Stevens and Payne (1999) illustrate that punitive damages have limited impact on corporate wrongdoing. Finally, Roth (1994) demonstrated that enhanced penalties had little impact on firearm violence. On the other hand, the certainty of punishment can have an effect on crime rates. Tittle and Rowe (1974) argue that if police could increase their effectiveness and make an arrest in at least 30 percent of all reported crimes, crime rates might decline significantly. This argument is supported by Zedlewski

(1983), who found that an increased probability of arrest can lower burglary rates. Therefore, the certainty of arrest is an important adjunct to severity of sanction in deterring crime. After all, a severe sanction that is not likely to be applied is unlikely to deter a criminal.

The certainty of a sanction lies squarely on the effectiveness of police operations. Considerable research has focused on police policies as they relate to arrest and/or crime rates. Most attention has been placed on increasing police activity. The reasoning is that if certainty of apprehension deters criminal behavior, then increasing the number of police officers on the street should lower the crime rate. However, much depends on how the police officers are deployed and what they are doing. Research has been conducted to determine whether increasing the number of police officers on random patrol can influence crime rates. The most often cited study of this nature focused on the Kansas City, Missouri police department (Kelling, Pate, Dieckman and Brown, 1974) where 15 police districts were divided into three groups. The first group was the control group that retained a normal police patrol. The second group was the proactive group that contained two to three times the normal amount of patrol forces. The final group was the reactive group from which all random patrol was removed. Police officers responded from the surrounding groups only when summoned by citizens living in the third group. Surprisingly, these variations in patrol patterns appear to have little effect on crime in the three groups of districts. The researchers were able to conclude that variations in police random patrol patterns appear to have little effect on crime rates. Merely saturating an area with police may not deter crime. However, focusing efforts on a particular problem in a particular area may have a deterrent effect.

Research has demonstrated that sudden changes in police activities termed “crackdowns” do not have long-term effects. Sherman (1990) studied 18 police crackdowns and concluded that although they initially deterred crime, the crime rates returned to previous levels once the crackdowns ended. The key words here are “once the crackdowns ended.” Perhaps certain areas in our cities deserve increased attention on a long-term basis beyond what is generally entailed in a police crackdown. Some locations that already enjoy this increased long-term attention include airports and schools. The question turns on whether selected drug sales areas deserve this increased attention, especially those areas that cannot depend on the efforts of local residents, since this may be a nonresidential part of the city.

The simple action of increasing a penalty as a deterrent to committing a crime is not necessarily related

to a decrease in that crime. According to rational choice theory, motivated offenders will choose to commit crimes when it is less likely they will be caught, where the target is suitable, and when the benefits are likely to outweigh the risks. With consistent police presence, therefore, the drug free zone legislation should lead to a reduction in drug sales arrests over time in the block groups where implemented, but not necessarily outside. In fact, if offenders deem that other locations in the city also emit the necessary “cues” meaningful to the location of a successful drug trade, it would be likely that drug crime may actually increase in these areas or, at least, remain high over time. Cues that are likely to be meaningful in identifying suitable locations for drug markets will include accessibility and the presence of potential customers.

Combination of Police Action and Legal Sanction

The question remains whether a drug free zone concept can be effective if it does not exhibit the disadvantages discussed above. What if it does not rely on severe sanctions, contains only a small part of the city, and relies on local police to enhance its effectiveness? In these cases, municipal officials identify only a few relatively small geographic areas that are the best places for selling illegal drugs in the city. These areas are outlined on a map and signs are posted notifying everyone that this is a drug free zone. In other words, the intent is to permanently remove drug offenders from this particularly sensitive area that they are likely to snap back to if removed by the police. Portland, Oregon; Albuquerque, New Mexico; and Cincinnati, Ohio have instituted such a program (Robinson, 2003). The present analysis measures changes in drug sales arrests when accounting for drug free zone status and police presence, among other factors, in Portland, Oregon.

The Drug Free Zones in Portland, Oregon

Portland is the largest city in Oregon with a population of 488,813 in 1998. Eighty-seven percent of this population was white, six percent African American, and three percent Hispanic. Seventy-four percent of adult arrestees test positive for drugs (Robinson, 2003). Socioeconomic status varies widely throughout the city from the wealthy white population in the south west of Portland, to the poor and black population in the northeast of the city. Two drug free zones were introduced in Portland in February, 1992 in their central business districts on each side of the Columbia River.

The function of Portland’s drug free zones is to

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exclude drug offenders from particularly sensitive areas of the city where drug dealing had proliferated in the past. Anyone arrested for a drug offense is excluded from any drug free zone for 90 days, and if convicted, excluded from all drug free zones for one year. The only exceptions are if the person lives, works, or attends school in a drug free zone. In essence, drug free zones in Portland act much like a curfew that excludes persons with certain characteristics (perhaps youth) from specific areas (Wilkstrom, 1998). If the police find a person who has been convicted of a drug offense in a drug free zone, they arrest him or her on a trespassing charge.

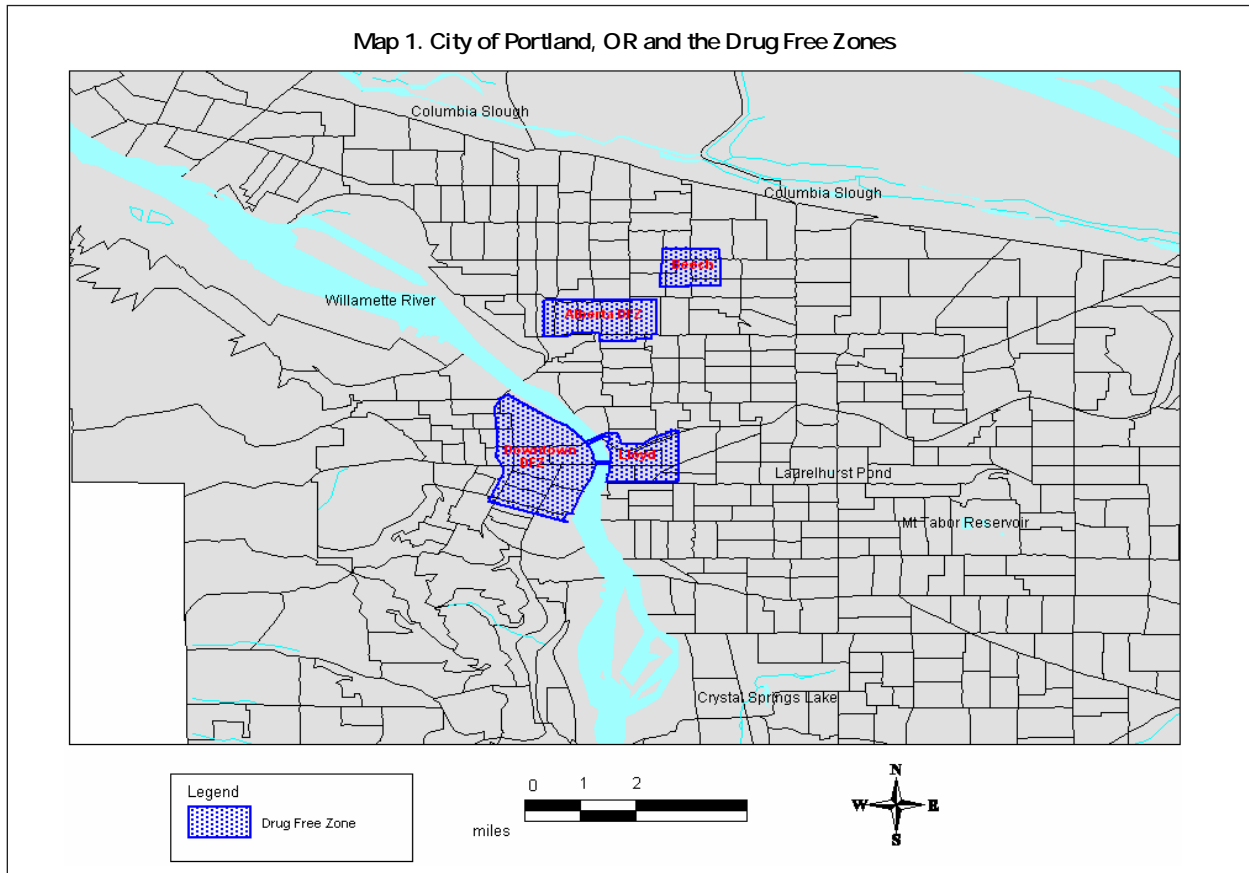
In order to effectively enforce the drug free zone legislation, additional police were dispatched to the drug free zones (Robinson, 2003). These officers were to focus their attention on identifying known drug offenders who may be in the drug free zones. Rather than random, it was a focused patrol on drug offenders. Therefore, we have both general deterrence in the form of additional police increasing the certainty of arrest for drug offenders and the special deterrence of a trespassing law increasing the severity of punishment of those previously arrested and convicted of a drug law. In fact, the constitutionality of

the drug free zone legislation was challenged, because it added a second sanction to offenders already punished for breaking a drug law (Robinson, 2003).

In February of 1997, the city council of Portland added two drug free zones in residential areas. Since February 1997, four drug free zones operate in Portland (see Map 1). These four drug free zones comprise only 2.4 percent of the total area of the city of Portland. Therefore, there is plenty of area for drug dealers and users to occupy, and the drug free zones are small enough to be manageable by police authorities. They do not monopolize an inordinate amount of scarce police resources. The question is whether or not these ordinances have been effective in reducing drug-related activity (as measured by drug sales arrests) over a long-term basis in these selected geographic areas.

The Effectiveness of Drug Free Zones in Portland

Between 1990 and 1998 there were 17,881 drug sales arrests in the city of Portland. The drug free zones were established in areas where arrests for drug sales were clustered spatially. Past research has demonstrated that drug sales concentrate in areas that have locational



advantages for selling illegal drugs (Rengert et al., 2000). In their study Rengert et al. determined that illegal drug sales tended to locate in those areas where the aggregate of drug purchasers would have to travel the minimum number of person miles to obtain illegal drugs. These areas were centrally located among the residences of potential drug consumers. If these areas are the places where the most money can be made selling illegal drugs, then removing drug dealers from these locations removes some of the profit from the drug dealing enterprise in the city. In other words, there is economic rationale to keeping the drug dealers from these profitable locations to which they are likely to snap back if pressure is not continued.

This research measured the likelihood that a block group would be deemed a “suitable” location for a drug market, according to the geographic perspective. To achieve this, a spatial autocorrelation model of block group drug market “propensity” was developed. This measure accounted for the inter-block group influences on drug sales arrests or spatial autocorrelation. In other words, the number of one block group’s drug sales arrests is assumed to be dependent upon all of the other block groups’ numbers of drug sales arrests. The shorter the distance between two block groups, the stronger the influence is expected to be. A higher spatial autocorrelation score is representative of a higher likelihood of a drug market location.

The value of a block group’s indicator of spatial autocorrelation is labeled as that block group’s “nearby arrest propensity.” The nearby arrest propensity of each block group was calculated using the 2-stage least squares estimator. The following passage provides a detailed description of this procedure.

Operationally this amounts to a first-stage ordinary least squares regression in which the “potential” variable, Y^* depends on a matrix, X , of exogenous variables. Predicted values of Y^* from this first-stage regression, which

have been “purged” of their correlation with the error term of model 2, are then entered as an exogenous variables [sic] in a second-stage ordinary least squares regression with Y as a dependent variable, i.e., into the estimation of model 2. (Land, Deane, Blau, 1991:240)

Essentially, for a single block group (let’s say block group A), the control for nearby arrest propensity is a yearly, predicted value. The score for block group A is removed from the analysis of the yearly, predicted value before calculation is performed. The prediction is performed upon each block group’s number of annual drug sales arrests. In other words, each block group’s number of drug sales arrests is predicted using multiple regression. The predictors in this model, however, cannot be entered into the final analysis (i.e. the growth curve model) and should not be highly correlated with any of the predictors included in the final analysis. The yearly predicted values are then weighted by block group A’s distance from every other block group and then summed to achieve a single year’s value of nearby arrest propensity. This was performed for all 536 block groups for each of the nine years.

Table 1 shows the variables that were used to predict a block group’s nearby arrest propensity for drug sales arrests. These variables included: how far away the block group was from the central business district (CBD),¹ whether the block group was located in the northeast police precinct after the implementation of the downtown and eastside drug free zones, the number of bus stops in the block group, and the centroid longitude of the block group. In essence, the value of a block group’s nearby arrest propensity decreased the further it was away from the CBD, increased if it was located in the northeast precinct, increased with higher numbers of bus stops, and increased the further east it was located relative to all other block groups in the city. The predictors of nearby arrest propensity were chosen for their theoretical relevance to the explanation of spatial locations of drug sales arrests.

Table 1. Explanatory Model of Nearby Arrest Propensity (Spatial Autocorrelation) for Block Groups, Showing Collinearity Diagnostics in Portland, Oregon, 1990-1998

Predictors	b	Std. error	Beta	p<	Tolerance	VIF
Distance away from CBD	-761.02	14.79	-.542	p< .001	.894	1.119
Precinct is northeast 94-98	3668.14	157.71	.255	p< .001	.825	1.211
Number of bus stops	61.34	2.59	.239	p< .001	.966	1.036
Centroid longitude	8702.2	1385.84	.066	p< .001	.904	1.106

$r^2 = .527$

Table 2. Correlation Table of Level 1 Predictors of Number of Drug Sales Arrests with Indicators of Nearby Arrest Propensity for Block Groups

	Arrests	Level 1 Predictors				Nearby Arrest Propensity			
		Time	Pop.	DFZ	Police	CBD distance	NE precinct	Bus stops	Long.
Arrests (number)		.005	-.065 **	.322 **	.037 *	-.101 **	.033 **	.351 **	.030 *
Time (years)	.089 **		.029 *	.076 **	-.190 **	.000	.000	.000	.000
Population (number)	-.025	.011		-.122 **	-.032 *	.335 **	-.185 **	.106 **	-.168 **
DFZ status (0= no, 1= yes)	.220 **	.076 **	-.146 **		.120 **	-.182 **	.061 **	.358 **	.010
Police officers (number)	-.070 **	-.232 **	.008	.111 **		-.140 **	-.135 **	.110 **	-.234 **
CBD distance (miles)	-.212 **	.000	.405 **	-.245 **	-.121 **		-.272 **	-.133 **	.006
NE precinct (0= no, 1= yes)	.295 **	.000	-.203 **	.061 **	-.080 **	-.353 **		-.087 **	.296 **
Bus stops (number)	.161 **	.000	.214 **	.116 **	.066 **	-.053 **	-.094 **		-.052 **
Longitude (centroid)	.241 **	.000	-.176 **	.024	-.224 **	-.076 **	.359 **	-.066 **	

Note: Pearson's R above the line, Spearman's rho below.
 ** = p < .01; * = p < .05

The nearby arrest propensity predictors are included in a correlation matrix with the other time-varying covariates at level 1 in Table 2.

The bivariate correlations confirm a number of relationships central to this study. A significant relationship exists between time and number of arrests per block group. Number of arrests is also significantly related to police presence. Drug free zone status is significantly related to number of arrests and police presence.

A growth curve model measured changes in drug sales arrests by block group over the nine-year period. The independent variables are:

1. Linear time (by year) to control for long term time trends in illegal drug sales arrests in the city in general,²
2. Nearby crime propensity (to control for accessibility to regional customers and spatial autocorrelation; varies by year),
3. Block group population for each year as a measure of

potential local customers for illegal drugs,

4. Number of police officers allocated to a block group for each year as a measure of the general deterrence of certainty of punishment, and
5. Whether or not a block group was in a drug free zone (varies by year) as a measure of the special deterrence of severity of sanction.

No predictors were centered. The variances of the level 1 measures were fixed. The dependent variable is the number of drug sales arrests per block group. The assumption is that the higher the number of drug sales arrests in a block group, the more active the drug market place in that location. The equations for the model is represented as follows (see equation 1).

Linear time simply measures changes in the number of drug sales arrests by block group for each year.³ Nearby crime propensity measures of relative location within the city are associated with the likelihood of a drug market being established and serve as a measure of the “cue emitting potential” of a block group. Block

Equation 1. Non-Linear Poisson Growth Curve Model Explaining Number of Drug Sales Arrests by Block Group

Level-1 Model

$$E(Y|B) = L$$

$$V(Y|B) = L$$

$$\log[L] = B_0 + B_1*(YEARS) + B_2*(STPRECP) + B_3*(DFZYES) + B_4*(COPS) + B_5*(POPYRBLK)$$

Level-2 Model

$$B_0 = G_{00} + U_0$$

$$B_1 = G_{10}$$

$$B_2 = G_{20}$$

$$B_3 = G_{30}$$

$$B_4 = G_{40}$$

$$B_5 = G_{50}$$

where: "YEARS" = time, "STPRECP" = crime propensity, "DFZYES" = in a drug free zone, "COPS" = number of police officers, "POPYRBLK" = block group population

group population is calculated for each year using the 1990 Census and the 1996 American Community Survey Update. The number of police officers is an average of police officers allocated annually to the precinct across all block groups within that precinct. Drug free zone status is represented by 1. Not a drug free zone status is represented by 0.

The Analysis

Due to the large (approximately 65 percent each year) majority of block groups with no drug sales arrests, the analysis uses a non-linear Poisson model that assumes over-dispersion. As shown in Table 3, the first independent variable is the linear time variable. This variable controls for linear time trend in the numbers of drug sales arrests for all of the block groups. Time has a significant relationship with the number of drug sales arrests, demonstrating that for every year increase in time, the number of drug sales arrests per block group decreased by a factor of 0.98, controlling for all other predictors. Each year, therefore, the number of drug sales arrests per block group is expected to decrease by 2.02 percent. In other words, the measure of time is controlling for a slow, linear decrease in drug sales arrests in block groups from 1990-1998.

Nearby arrest propensity shows a significant, positive relationship with the number of drug sales arrests within block groups. In other words, as a block group nears the CBD (in miles), has more bus stops (count), if it was located within the northeast precinct in 1994-1998 (yes=1), and was relatively further east than all of the block groups combined, the number of drug sales arrests in the block group increases by a factor of 1.73 (73.45

percent), while controlling for all other predictors in the model.

The block group population shows a significant positive relationship with the number of drug sales arrests in block groups. For each additional person (potential local customer) the number of drug sales arrests increases by a factor of 1 (0.04 percent), while controlling for all other variables in the model.

The number of police officers shows a positive and significant relationship with the number of drug sales

Table 3. Explaining Changes in Number of Drug Sales Arrests, 1990-1998

Predictor	Beta	Percentage change
Time	-0.0204 ** -(0.006)	-2.02 %
Nearby arrest propensity	0.5507 *** -(0.041)	73.45 %
Block group population	0.0004 *** (0.000)	0.04 %
Number of police officers allocated to block group	0.0693 * -(0.031)	7.18 %
In a DFZ? (0= no, 1= yes)	0.0522 -(0.046)	5.36 %
U0	1.4953	
DF	530	
Chi-square	92515.9	
p-value	p< .001	

Note: * = p< .05, ** = p< .01, *** = p< .001; standard error in parentheses. Percentage change is calculated by (100[exp(beta)-1]).

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arrests in a block group. As the average number of police officers increases in a block group in a precinct, the number of drug sales arrests increases by a factor of 1.07 (7.18 percent) while controlling for natural change over time, block group population, nearby crime propensity, and DFZ status.

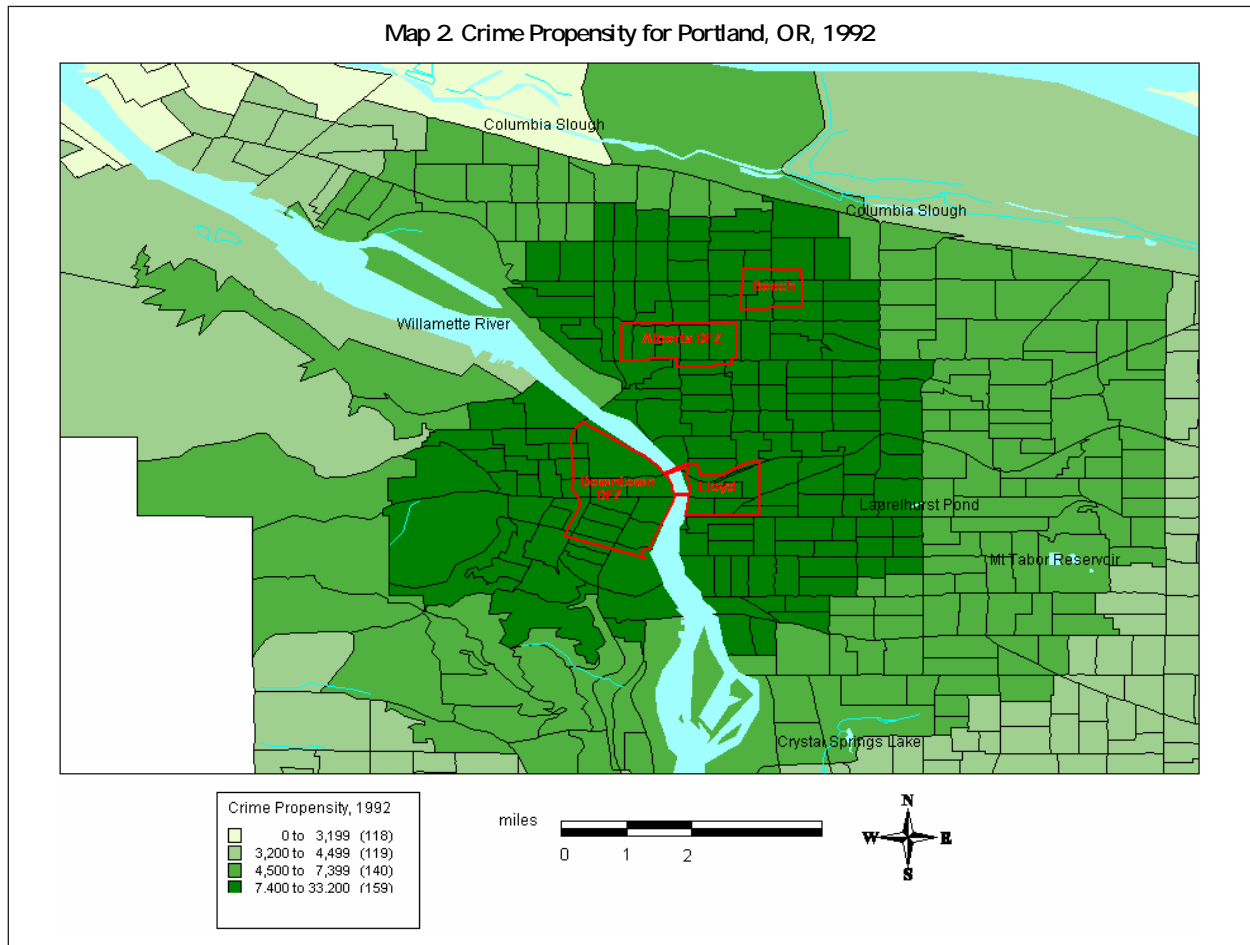
When the previous possible time related explanations of drug sales arrests within a block group are controlled for, the addition of whether a block group is contained within a drug free zone is not a significant predictor of changes in the number of drug sales arrests. In other words, the additional sanction for the special population of those arrested and convicted of drug offenses does not significantly lower the number of drug sales arrests when other explanatory variables are controlled for.

Interpretations

Clearly, nearby crime propensity was the strongest predictor of drug sales arrests followed by the number of police officers. The fact that being contained within

a drug free zone was not significant is also an important finding. There are a couple of interpretations of this result. It could be that just like in drug free school zones in central Philadelphia (Rengert and Chakravorty, 1995) this type of legislation has little impact on discouraging drug dealers from selling from profitable locations. The crime propensity measure, after all, indicates the suitability of a location for a drug market. According to this research, adjacent block groups are likely to be similar to each other in crime propensity. Map 2 shows the values of the measure of crime propensity for a single year in Portland.

The map shows that areas that are similar in suitability for the location of a drug market tend to be located in a band including and surrounding the CBD. The areas that are designated as drug free zones, and thus meriting increased police presence, are surrounded by similarly crime prone block groups. In response to the drug free zone legislation, drug dealers could very well have found equally suitable locations very close by. In other words, the same geographic characteristics of the



block groups within the DFZs that made them attractive to drug markets can be found close by within the city.

Although drug free zone status was not significant to the model, the number of police officers present in a block group was significant. Drug free zones provide public officials with a reason to allocate more police than they might otherwise be able to justify to an area that contains active illegal drug markets. The average number of police allocated to a block group in a precinct was positively related to the number of drug sales arrests. This makes intuitive sense given that more officers on duty should result in more arrests being made. Once this variable was controlled for, there was no further change explained by the legal issue of trespassing arrests for prior offenders caught within a drug free zone. In other words, the legal aspects had no additional effect once the increased police allocation and other explanatory variables were controlled for.

The significant effects of increased police presence are especially important when considered in light of the natural changes in time. Overall, on a yearly basis, the number of drug sales arrests per block group decreased. When the average number of police officers increased in a block group, however, so did the number of drug sales arrests. The direction of the relationship of these variables offers more support to the notion that the number of drug sales arrests is highly tied to police deployment. It would not be surprising, therefore, that the number of drug sales arrests would increase over time in the drug free zones where police were deployed in greater numbers than in other parts of the city.

Limitations

Interpretation of the findings from the analysis needs to be considered in the context of the limitations of the data. The measurement of drug free zone status, the use of official arrest data, the nature of the time period examined, and the measure of police enforcement are each limitations (among others) of the study that influenced the results of the analysis. Below, the results of the study are contextualized within these limitations, and suggestions for improvement of future research are offered.

Measuring Drug Free Zone Status

First, the drug free zone status was measured as a simple no/yes variable. For each year that a block group was not in a drug free zone, it scored a 0. For each year that a block group was in a drug free zone, it scored a 1.

From a practical perspective, there was no better way

of measuring block group drug free zone status with the available data. The implementation of or changes to the drug free zone legislation were carried out in the February of each year. To simplify measurement of effect and to keep the different predictors equivalent as to temporal “starting point,” the analysis was conducted assuming a January start point.⁴

The absolute distinction implied by the no/yes coding also implies some sort of magical change in the block groups included in drug free zones from one minute to the next. This type of absolute distinction is unlikely to represent the enforcement reality of the drug free zones. Considering that the locations of the drug free zones were determined based on police knowledge of areas in the city with high rates of drug crime arrests, and as then later negotiated with the district attorney and neighborhoods, it could be that the police were already more closely scrutinizing these areas before the drug free zone status was applied. In fact, there were many community meetings to discuss whether these areas should be designated, suggesting that they were already under intensive targeting by police. A better measure could include a gradient of influence over time; before, during, and if applicable, after DFZ legislation was implemented in specific areas.

Enforcement

One option for measuring the strength of the effect of the drug free zone implementation separate from enforcement practices might take into account other ways in which the drug free zone status of an area is communicated to people. An example of such a measure in Portland is the signage used in the downtown notifying all passers by that they are in a drug free zone. Virtually every window of a business or retail location in the downtown drug free zone contains such a sign.

The use of signage in an area dominated by retail and professional land uses is accomplished more easily than in a residential area. In a residential area, a primary means of communication of drug free zone status could include “word of mouth” among residents of the community. Although a measure of this form of notification would be difficult to obtain without a sample survey or strong qualitative work, it is highly likely that communication of this sort exists.

The measure of police enforcement is also a highly imprecise measure of policing activities relating to patrol and location of personnel deployment. A more realistic measure of actual patrol of the block groups could result in different findings than are presented in this

study. Also, a limitation may be that some composite or interaction measure of DFZ boundaries and related police deployment may have been a better measure to represent the effect of implementing the drug free zones.

Arrests

A third limitation of this study is located in the use of official data that offer a narrow interpretation to spatial patterns of crime. This study relied on the use of official arrest data from the Portland police, because these data are the only source of all known drug sales arrests that also record the street-level address of where the arrest occurred.

There are shortcomings associated with this approach that affect the depiction of the spatial patterns of drug sales in Portland in this study and have ramifications for the measured effectiveness of the drug free zone legislation. The incidence and locations of different crimes will be recorded by official statistics depending upon the nature of the crime in question. Due to the nature of drug sales, official statistics are likely to be less comprehensive in their recording of incidents than for other types of crime (e.g., burglary, robbery, and murder).

In other words, this study is not able to measure the effectiveness of the drug free zone legislation upon “indoor” drug markets. This study’s observed spatial and temporal variation of drug sales arrests in Portland reflects only the more visible types of drug markets that come to the attention of the police, where the police can interdict. In fact, this study is careful to recognize that the dependent measure, drug sales arrests, is closely linked to police deployment and resources, where the police are targeting drug crime, and is at least a good measure of that.

Time Period

Fourth, the nature of the time period examined prevents a truly longitudinal description of crime and social trends in Portland. The time period selected included two years before the implementation of the DFZ legislation and a year after the last drug free zones were implemented. A still longer time period may have yielded a better examination of the effects of the DFZ legislation on drug sales arrests in Portland.

The data for this study did not allow a temporal lag of DFZ or enforcement impact, instead assuming an impact that started at the same time as increased enforcement and/or the drug free zone status. As with any newly implemented program this is a highly unrealistic

assumption. Effects of the drug free zones could have preceded the formal implementation, given the intensive nature of community participation and involvement in the periods prior to implementation, as well as heightening gradually as the new policing routines and communication of the boundaries began to take effect.

It may be that use of yearly measures resulted in too gross a measure to accurately observe changes in the numbers of drug sales arrests at a block group level. The yearly data may hide changes in effects that may be more clearly documented at a monthly level. For example, an increase in police activity and in drug sales arrests might be expected at first. But over time, a decrease in police activity and in drug sales arrests may be expected. At the same time, an increase in nearby drug sales arrests may be observed after the sellers begin to look elsewhere in the city to locate their businesses.

In other words, a shift downward in drug sales arrests inside the zones may be observed after an initial increase resulting from the implementation of any punitive and/or deterrent effects. Nearby drug sales arrests may increase over time also, as the deterrent and punitive effects of the drug free zone take hold.

Conclusions

A general purpose of this study was to examine changes in spatial patterns of drug sales arrests over time in Portland, Oregon. Of particular interest were two factors. The first factor was whether measures of accessibility and customer location that area associated with the geographic perspective were related to changes in drug sales arrests. The second factor was whether increased sanctions associated with drug free zones in Portland were effective in decreasing drug sales arrests after other geographic factors are controlled for, including increased police resources focused on these areas.

Several cities including Portland, Oregon have established drug free zones. There are at least two features of Portland’s drug free zones that theoretically should lower the rate of drug sales arrests. The first is the theoretical reduction in location suitability when an additional sanction is associated with a specific location of a drug crime. If a person has been arrested and convicted of a drug related offense and is found within a drug free zone, that person can be arrested for trespassing. This sanction is designed to keep drug offenders from these sensitive areas except for work, school, or residential purposes. From a motivated offender perspective, the threat of this additional sanction should reduce the suitability of an area for a drug market location.

A second aspect of Portland's drug free zones is that it provides a rationale for city officials to concentrate police resources on a long-term basis. Unlike a traditional crackdown, police resources are not removed from these targeted areas. Rather, the drug free zones are deemed sensitive enough to mandate increased police attention on a semipermanent basis. This increased police attention increases the certainty of arrest, much like a police crackdown does over a short-term basis.

On the other hand, the increased certainty of arrest associated with increased police resources did have a significant positive effect on drug sales arrests. The drug free zones provided a rationale for city officials to reallocate police resources to these particularly sensitive areas, including Portland's central business district. The rationale permitted increased numbers of police personnel to enforce the trespassing laws of drug offenders as well as to arrest those selling and/or possessing illegal drugs in the drug free zones.

The measure of crime propensity indicated that offenders may very well have a number of suitable locations to choose from if their business is disrupted by a law enforcement interdiction like the DFZs. These areas encompassed large regions around each of the DFZs. Theoretically, therefore, if offenders found it difficult to sell drugs in a DFZ due to increased police presence, they could easily find other suitable places within short distances outside of a DFZ. The crime propensity measure may be helpful in future studies when measuring displacement.

Endnotes

1. The distance is measured in miles from the centroid of the block group to the centroid of the CBD.

2. Controls for non-linear time trends were not necessary, since a non-linear time trend could not be modeled significantly.

3. Adequate variation in the number of drug sales by block group over time was established before conducting further analysis. The significant variation was established via bivariate analysis (as shown in Table 2), ANOVA, and finally via the significant predictor in the growth curve model.

4. Anecdotal evidence based on media attention in The Oregonian regarding the introduction of new drug free zone areas shows that extra attention was paid to these areas (both by the communities and the police)

shortly before they became official, thus also lending impetus to a measure that was measured a short period of time before the official start date.

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