E COLOGICAL PREDICTORS AND POLICE ALLOCATION POLICY

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ABSTRACT

Ecological predictors are major factors influencing the design and allocation of police units. The ecological approach encompasses a variety of environmental variables which determine environmental composition of the police district. This study indicates that these variables are effective discriminators of police allocation policy. The classification of police districts is supportive of the general conclusion that the ecological dimension is important for police deployment in large cities.

The earliest studies on criminal behavior were studies of the distribution of crime. Shaw and McKay, in their study of Chicago, found that property offenses decreased in number as the distance from the center of the urban areas increased; a phenomenon known as the "gradient hypothesis." They also noted that these areas were centers of crime and delinquency and were characterized by economic dependency, high industrial concentration, physical deterioration, rented homes, black and foreign populations and few social institutions supported by the local residents [1, 2]. They concluded that social and economic factors associated with highly industrial and commercial areas were the primary cause of property and other related crimes. In other words, these areas perpetuated or were training grounds for potential criminals. Edwin H. Sutherland corroborated their hypothesis by theorizing that criminal behavior is a learned process through the interaction with other criminals. Therefore, crime and delinquency could be reduced if the physical, economic, and social conditions of these neighborhoods were constructively altered [3].

Some studies argue that the neighborhoods collect criminals rather than being a corrupting influence upon the potential losers [4-6]. Other studies offer supportive evidence that crime rates vary from neighborhood to neighborhood,

depending on the opportunities for pursuing particular activities [7-10].
Although the evidence is clear that the ecological environment does effect the
potential development of criminal activities, it is not clear as to the effects of
police policy on the nature of crime in an urban environment. That is, police can
optimize their allocation policies as criminals in searching for the setting which
is ideal for the opportunity for crime and arrest. Jeffrey Chapman's study of
the impact of police on crime is one of the few studies to attempt to also
examine the impact of crime on police [10]. Chapman points to the labor
inputs of police as important factors in changing the nature of a criminally
prone environment. The police labor inputs influence arrest rates, arrest rates
influence the crime rates, and the crime rate also influences the demand for
police. Thus, demand for police services is dependent upon the nature of the
community as well as the economics of crime. The purpose of this paper is to
examine the relationship between the environment of an area and the spatial
configuration of police districts. Further, an assessment of the best ecological
predictors of police allocation in a given district will be made. Finally, the
implications of our findings to studies of police behavior will be discussed.

METHODS

Studying the allocation of police within the urban context has not been a
central concern of criminologists for several reasons. First, the literature on
police systems has not clearly defined the nature and the criteria for the
allocation process for different types of police structures. The criteria of
allocation within the urban context has an important impact on the outcomes
of the police system. In fact, we often find that the nature of the police
structure is a constraint on the accurate measurement of allocation. Furthermore,
the secrecy which surrounds the measuring process is often a compounding
factor which inhibits any realistic assessment of the effectiveness of any change
in police allocation policy.

The usual measure of police allocation is the ratio of police per capita during
the fiscal year. Several problems exist in the use of this particular measure of
police allocation. First, police per capita fails in explaining the variation of
that ratio within an urban area. It also fails to tell the differential effect of
allocation in easing of crime. Further, policy proposals based on this measure
tend to promote the enhancement of police expenditures rather than promoting
the reallocation of police units.

A more concrete measure is the number of police man-hours spent in the
various police districts. There are several advantages to the use of this type of
measure. First, the physical presence of the police is a more accurate measure
of the actual allocation policy of the police system. Secondly, this measure
allows a unit of analysis that can be used to compare changes in the distribution

of police. However, the limitation is that the data are recorded from the worklogs of the police officer. A major source of error is the inaccurate recording of time spent in an area. Invariably, this is a problem which underlies all aggregate data collection.

The data were collected from the worklogs of the San Diego police department which are recorded on a quarterly basis. The other variables in the analysis were collected from census information and police records of district characteristics. These variables represent the ecological nature of an area and the crime rate of an area. The data were aggregated into forty-seven statistical units which form the three major police districts. All rates of crime are logged because of the nonlinear nature of crime [9]. The aggregate statistical units were the unit of analysis for comparison of police districts.

The choice of analytical procedure must be guided by the research question and the kinds of data that are available. The questions in this research suggest a combination of discriminant analysis and regression analysis. Our concern is for the discriminant effect of the predictor variables upon police districts and the effect of these predictors on police allocations in the district.

ANALYSIS OF DATA

In Table 1 is presented the factor structure for the variables used in this analysis. The relative values of each variable used in the analysis is indicated by the discriminant factor score for each of the areas. The higher loadings in this case indicate on which variables the three areas are different. Of the seventeen variables used in the analysis only eight were found to be statistically significant in their ability to discriminate between police districts. An approximate F test supports the conclusion that there were significant differences between police districts.

In examining the factor structure of each police district, several interesting findings emerge. The north city district fits the pattern of most cities in being a residential community. A moderate score is noted on high income, low population density and high residential land use. Further we find a high loading on per cent white and low score on per cent ethnic. The crime pattern of the area is also supportive in that burglary is the most priminent crime. Thus, the district characteristics confrom to the general residential pattern of American cities.

In the central district the discriminant structure is higher on crimes other than burglary. There was also a notable increase in the loading on other ecological variables. This can be seen in the drastic increase of nonwhites, lower incomes and the changing pattern of the land use. This volatile mixture offers a dramatic contrast to the north city district. The ingredients to this mixture suggests a district which would rank high in police concerns.

Table 1. A Factor Structure of the Discriminant Function
for Predictors of Police Districts

Predictor Variables	North City	Central	Southern
Crimes			
Robbery[a]	.23	.47	.25
Burglary[a]	.52	.21	.35
Grand Theft	.09	.11	.45
Petty Theft	.15	.07	.22
Auto Theft[a]	.04	.18	.45
Ethnicity			
% Spanish	.01	.18	.20
% Black	.10	.38	.05
% White[a]	.64	.26	.15
Land Use			
Residential[a]	.65	.05	.33
Commercial	.15	.19	.10
Industrial[a]	.25	.30	.19
Agriculture	.10	.00	.22
Vacant Land	.19	.13	.18
Other Variables			
Population Density[a]	.45	.18	.11
Low Income[a]	.05	.31	.45
Middle Income	.19	.09	.04
High Income	.37	.15	.10
Canonical Correlations	.54	.32	.23

[a] Significant at .05

Note: All variables are logged per 1000 population.

The third police district has to be treated as a special case because of its' proximity to the border. The discriminant structure for the southern district represents the influence of the heavy border traffic. The high loadings indicate the northward migration of aliens and the availability of low-paying agricultural labor. The types of crime most prevalent in this area are property crimes. In some, the discriminant structure suggests that the southern area is much similar to the central city district and typical of police districts which are close to border cities.

In Table 2, the results of the classification analysis is presented. The classification analysis indicates that seventeen out of forty-seven statistical units were incorrectly classified. With 80 per cent of the statistical units correctly classified with these eight variables, there is some validity to the measures. An approximate F test also supports this conclusion of significant

Table 2. Classification Analysis of Police Districts
Using Ecological Predictors

| | Districts | Actual Group | | | |
		North City	Central	San Ysidro	Totals
P r e d i c t e d	North City	20	3	0	23
	Central	5	16	0	21
G r o u p	San Ysidro	1	0	2	3
	Totals	26	19	2	47

Hits = 38 or 80%
Misses = 17 or 20%

differences between districts given these variables. Further analysis of the relative importance of the variables in predicting police allocation is warranted given the classification matrix.

Regression analysis of the eight variables within each district is presented in Table 3. A dummy variable was used to represent police allocation for the three districts. Several observations can be made about police allocation from the equations in Table 3. First, the relative strength of each predictor varies as to the police district under study. For instance, population density and the ethnic composition of an area have positive effects on the allocation of police for both the north city and central city, but little effects on the allocation for the southern area. As expected, the order of magnitude of the crime variables indicate that crime rates are the most important predictor of police allocation. However, residential land usage and racial compositon are important possible intervening variables in each equation.

All of the predictors presented in this study explain a good percentage of the variance for each area. The predictors explain a majority of the variance for the central city area and not as much variance as the southern area. The residential nature of the north city district may be a factor which inhibits more explanation of the variance in that area. Possible sources of unexplained variance in each district can be attributed to aggregation erros and data collection errors. Further limitations of this analysis can easily be discerned from the data collection methods, census errors, and aggregation errors.

Table 3. Dummy Regression Coefficients for Police
Allocation by District Characteristics

District Characteristics	North City		Central		Southern	
	b	B	b	B	b	B
Low Income	-.05	-.15	.30	.43	.38	.49
High Income	.18	.24	-.07	-.30	.00	-.32
Population Density	.06	.15	.07	.45	.00	.07
Residential Land Usage	.23	.44	.02	-.05	.17	.27
Industrial land Usage	.08	-.15	.02	.28	.04	.13
Per Cent White	.10	.40	.15	.21	.00	.00
Burglary	.15	.17	.23	.42	.16	.46
Robbery	.10	.27	.33	.42	.06	.44
R^{2a}	.60		.66		.56	

Note: N=47 statistical areas
[a] Significant at the .05 level

SUMMARY

This study has attempted to analyze and compare various ecological variables and the police allocation process in an urban city. Using data collected from the city of San Diego, the study attempted to compare the different police districts with predictors of how police are allocated. Our findings indicate that police allocations depend significantly upon the nature of the area.

The implications of this study are quite clear for the study of police policy. The task now is to discover the relationship overtime for police allocation. Does the allocation formula vary as to the changing nature of an area? What effect does the reduction of crime have on the allocation strategy per police district. These questions suggest that further studies are needed to explore the dynamics of police allocation.

REFERENCES

1. C. R. Shaw and H. B. McCay, *Juvenile Delinquency in Urban Areas,* University of Chicago Press, Chicago, Ill., 1942.
2. K. Harris, *The Geography of Crime and Justice.* McGraw-Hill, New York, New York, 1974.
3. E. H. Sutherland, *Principles of Criminology,* Lippincott, Philadelphia, Pa., 1934.
4. R. Block, *Violent Crime: Environment, Interaction and Death,* Lexington Books, Lexington, Mass., 1977.
5. D. Reppetto, *Residential Crime,* Ballinger Press, Cambridge, Mass., 1974.
6. S. Booggs, Urban Crime Patterns, *Amer. Soc. Rev., 30,* pp. 889-908, 1976.

7. D. Capone, and W. Nicholas, Urban Structure and Criminal Mobility, Paper presented at the 27th Meeting of the American Society of Criminology, Toronto, Canada, 1975.
8. G. Plye, *The Spatial Dynamics of Crime,* University of Chicago Press, Chicago, Ill., 1974.
9. R. Brock, Community, Environment and Violent Crime, *Criminology, 17,* pp. 46-57, 1979.
10. J. Chapman, *The Impact of Police on Crime and Crime on Police: A Synthesis of the Economic and Ecological Approaches.* Institute of Government and Public Affairs, UCLA, California, 1973.

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