

SPATIAL DISTRIBUTION AND SOCIOECONOMIC CORRELATES
OF CRIME IN SAN BERNARDINO, CALIFORNIA

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The intraurban distribution of crime, and attempts to explain its patterns, are becoming increasingly important topics for Urban Geographers. This study plots the rates of major types of crime for the city of San Bernardino. Variables which measure the socioeconomic status of census tracts are analyzed so as to classify neighborhoods within the city. The patterns of violent and general crime are compared to each other, and to the distribution of neighborhood types. Regression analysis is used to test the relationship between crime rates and various factors hypothesized to be associated with crime generation. Results agree with parts of previous studies done for much larger urban areas. Crime in San Bernardino is divided spatially between general and violent types. However, both occur closely spaced in specific high crime areas. The general pattern for San Bernardino indicates a strong relationship between business areas and crime rates. No strong spatial correlation occurs between high crime rates and low income neighborhoods unless these neighborhoods have significant business districts.

Several studies have been made of urban crime patterns in which various socioeconomic variables were related to criminality and delinquency.¹ Much of the major work stems from the analysis of juvenile delinquency done for Chicago by Shaw, and later by Shaw and McKay.² In his earlier work Shaw points out the importance of studying the spatial distribution of delinquency which he found to be closely related to low socioeconomic status. Geographically the highest concentration of delinquency occurred in the central business district and there was a progressive downward slope in rates away from the C.B.D.³

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Schmid and Schmid's study of Washington State contains considerable intraurban crime analysis focusing on Seattle.⁴ In the 1972 study factor analysis was employed and three major factors were generated which are associated with crime and arrest data. The three factors are titled (1) low social cohesion - low family status; (2) maleness - crimes against person; and (3) crimes against property and sex offenses. Factor one is associated with purse snatching, auto theft and burglary. Socioeconomic indicators for this factor are high rates of separation and divorce, little population growth, few home owners, low income, and multi-unit housing structures. Factor two is associated with unemployed and unmarried males, a typical "skid row" situation. Crime types related to this factor include robbery, burglary, larceny, auto theft, and assault. The third factor is described by Schmid and Schmid as "offenses that tend to occur together spatially," and include shoplifting, check fraud, embezzlement, indecent exposure, and molestation of women and children. Crime in Seattle was found to be concentrated in the central area of the city with a secondary nucleus, high in drug arrests and property offenses, located near the university.

A major study of urban crime was prepared by the President's Commission on Crime for Washington D.C. Criminal offenses concentrate in what they term the "high risk" southeastern section of the C.B.D. Adult offenders are predominantly Black, male, poorly educated, young, products of broken homes and large families, unskilled, and erratically employed.⁵ In an attempt to explain the distribution of serious crime in Denver, Lee and Egan employ stepwise regression analysis. They find the major factors for explaining patterns of serious crime to be (1) distance from the C.B.D.; (2) percent of land devoted to industrial activity; (3) proportion of Blacks and Spanish surname population; and (4) mileage of through streets. By far the most important factor is the central business district. Lee and Egan suggest this is the major crime area due to low nighttime population, location of lucrative crime targets, and easy accessibility.⁶

A generalization of urban crime patterns based on several studies for different areas indicates the importance of central city location near blighted areas with low socioeconomic status.

This is probably a surrogate measure for the fact that these are the parts of the city where the poorer, less educated, and more marginally employed or unemployed tend to reside. It is also the area where opportunity to commit crime is the greatest. There is a relationship between race and criminal offenses with crime rates being higher for minorities. These persons are the most poorly educated and least employed leaving them less in the way of alternative life styles.

In this study the rates of violent and general crime are plotted by census tract for the city of San Bernardino. Variables which measure the socioeconomic status of census tracts are analyzed so as to classify neighborhoods within the city. The patterns of violent and general crime are compared to each other, and to the distribution of neighborhood types. Stepwise regression analysis is used to test the relationship between crime rates and various factors hypothesized to be associated with crime generation.

It should be pointed out that the patterns generated from this study are based on crimes reported to the police. This data must be assessed with care since it is known that there are geographical differences in the reporting of offenses, and in the degree and quality of police action. Major business districts tend to be patrolled more heavily than other parts of cities, and poor persons are less likely to report crimes since the inconvenience of reporting to the police and the possibility of testifying in court often outweighs their loss. However, it is beyond the scope of this study to analyze reasons for variation in crime reporting.⁷

CRIME PATTERNS IN SAN BERNARDINO

The number of offenses by major crime types were obtained by census tract for the period 1972-73. The various types of crime are grouped into two categories which are titled violent crime and general crime. Violent crimes include murder, robbery, aggravated assault, and forcible rape, while general crimes involve larceny, burglary, and auto theft. The actual number of crimes in each of the two categories are converted to rates of

crime per capita. Since population varies substantially for census tracts crime rates are more meaningful than number of occurrences. The means and standard deviations for general crime and violent crime are determined and census tracts are mapped with relation to their deviations from the respective means.

General Crime

General crime is highly concentrated in the central business area of the city. Only nine of thirty census tracts

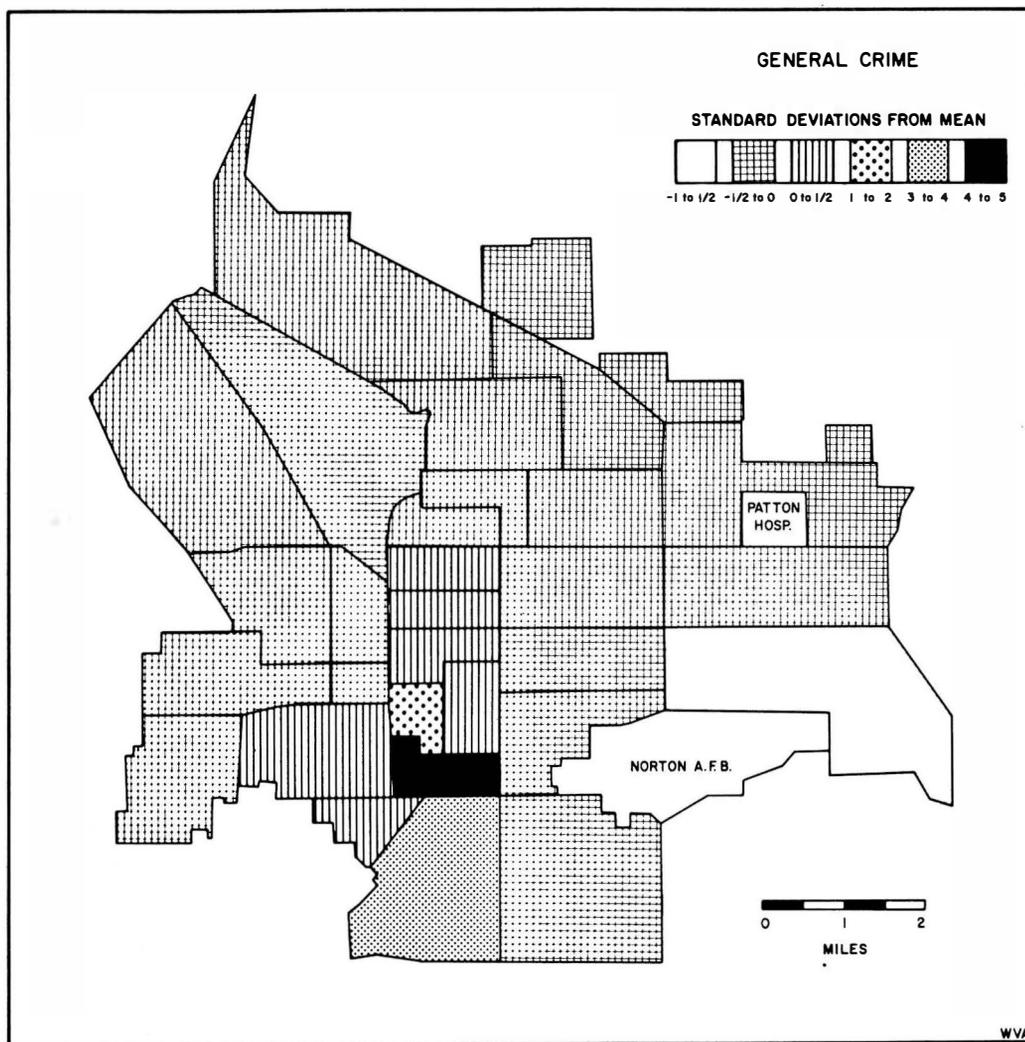


Figure 1. General Crime in San Bernardino, California.

have rates of general crime that are above the mean, and six of these nine are within one-half standard deviation of the mean. One tract falls between one and two standard deviations, one between three and four, and one between four and five standard deviations above the mean. Census tracts with the greatest positive variation are located contiguously and in the major downtown business district. The remaining tracts which are above the mean are situated immediately to the north of the high general crime area or just to the south and west (Fig. 1).

Twenty of the thirty census tracts fall in the range between the mean and one-half standard deviation below the mean. Only one tract is more than one-half standard deviation below the mean. The areas with lower rates of general crime are situated on both sides of the C.B.D., and extend northward to the limits of the city. The tract with the lowest general crime rate is east of the downtown area and contains considerable open land and orchard property (Fig. 1).

Violent Crime

Violent crime is also highly concentrated in the C.B.D. In this case twelve of the thirty census tracts fall above the mean. Five tracts are within one-half standard deviation of the mean, three between one-half and one, one between one and two, two between two and three, and one between three and four standard deviations. As with general crime, the tracts with the greatest degree of variation above the mean are situated contiguously and in the central business district. The census tract with the highest rate of violent crime is located adjacent to and just north of the tract with the highest rate of general crime (Fig. 2).

Areas with lower than average rates of violent crime nearly surround the C.B.D. on the west, north, and east sides. There is almost a concentric pattern distinguishable here with those tracts between the mean and one-half standard deviation below the mean situated between the high crime C.B.D. area and the tracts which are more than one-half standard deviation below the mean. The lowest violent crime rates are concentrated well

to the north and east of the downtown business district with the exception of one census tract located adjacent to and east of the C.B.D. (Fig. 2).

It is interesting to note that the major crime areas, both violent and general, occur in areas of the city where major urban renewal is underway and has made considerable progress. The census tract with the highest rate of violent crime is the location of the city's newest redevelopment project which includes a major shopping mall, convention center, and several new government buildings. These crime patterns indicate that planners working with C.B.D. renewal must be cognizant of the crime element as a potential problem for their projects.

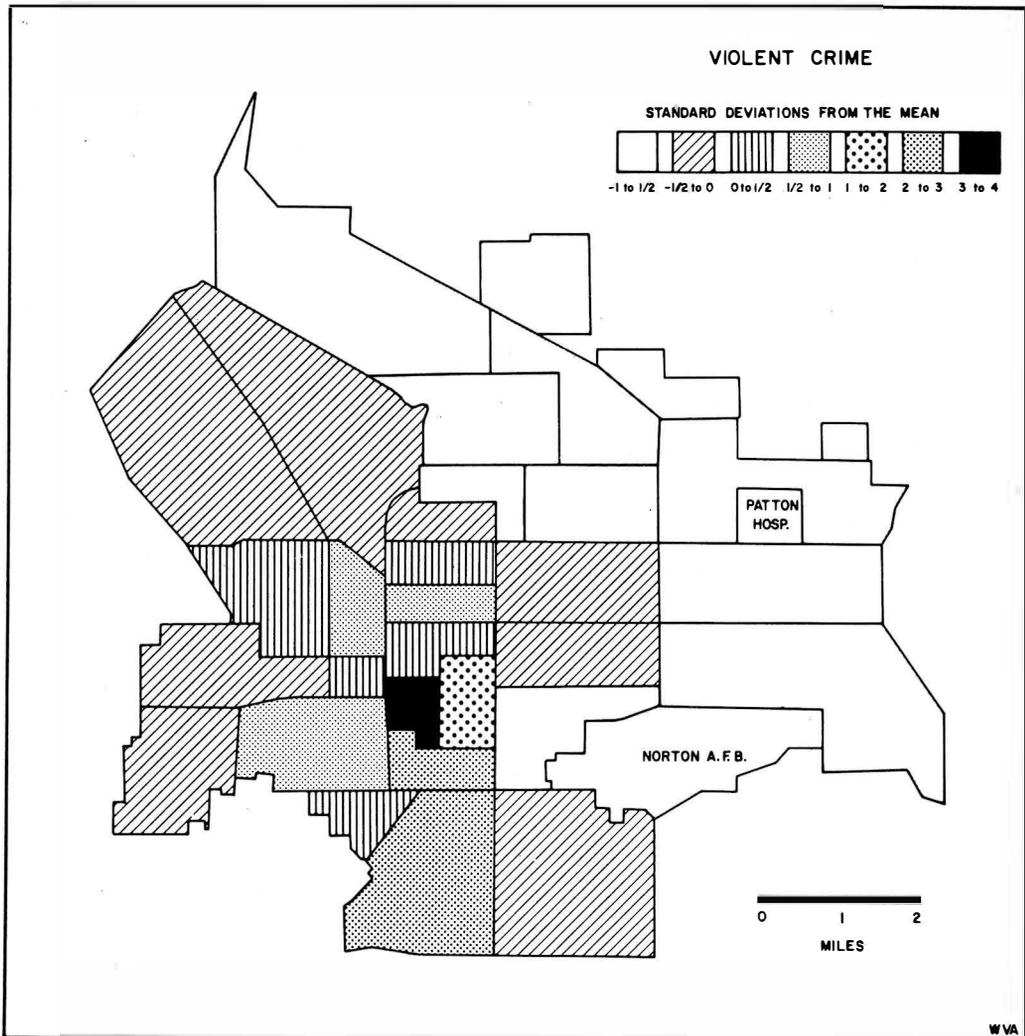


Figure 2. Violent Crime in San Bernardino, California

NEIGHBORHOOD ANALYSIS

A study of the socioeconomic variations of census tracts was made to permit a comparison of neighborhood types with the patterns of general and violent crime. In this case I wanted to combine a number of indices of economic and social variation into a smaller number of correlated groups. Factor analysis was used to achieve this goal and two major factors were generated. Factor one is identified as being indicative of problem areas. It is primarily composed of variables which measure low income, racial minorities, and crowded housing. Factor two associates high income, high home value, and better educational attainment (Table 1).

TABLE 1
Factor Structure for Neighborhood Analysis

Variables	Factor 1 Loadings	Factor 2 Loadings
Percent of Black population	0.81570	-0.16066
Percent of population 65 years and older	-0.15758	-0.16414
Percent of population 18 years and younger	0.52242	0.22398
Percent of population with Spanish as native language	0.54438	-0.16869
Percent of population with high school education	-0.36046	0.84421
Percent of families in same residence 1970 as 1965	0.32615	0.15246
Percent of population unemployed	0.15747	-0.03678
Mean income	-0.13872	0.96936
Percent of families on welfare	0.74705	-0.25200
Percent of families with income below poverty level	0.58894	-0.38363
Percent of homes with more than one person per room	0.92322	-0.11995
Median value of housing units	-0.02540	0.93667

The so-called "better neighborhoods" in San Bernardino are situated to the north and northeast of the central business district. Eight census tracts are classified as "high value" residential areas. These are spatially separated from "low value" areas by a buffer zone consisting of twelve census tracts intermediate in socioeconomic status. There is one case where a higher income neighborhood is adjacent to an area classified among the lowest in socioeconomic characteristics. In this case Interstate Highway 15 forms the boundary line between the two

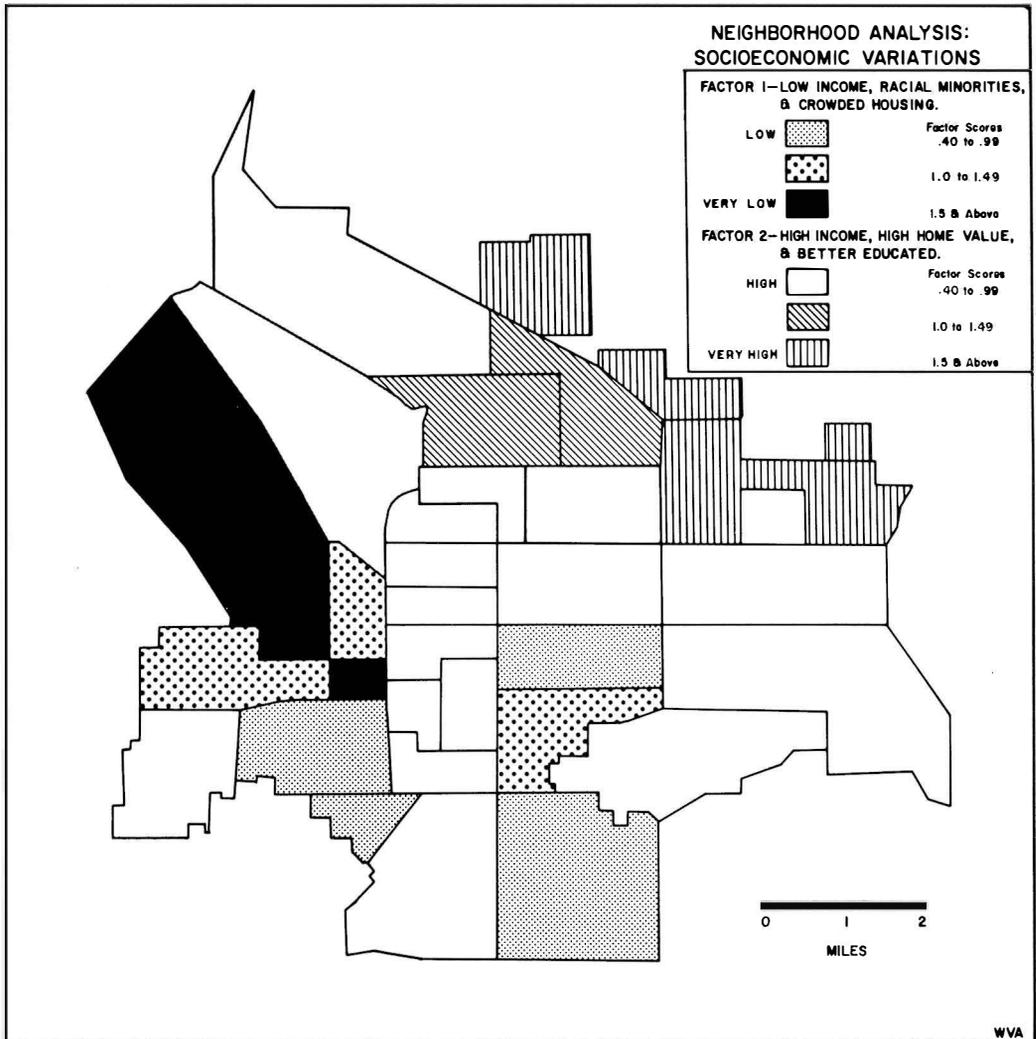


Figure 3. Neighborhood Analysis of San Bernardino, California

census tracts. Interestingly, this freeway separates the majority of the low income, racial minority areas from the central business district and "higher value" neighborhoods. Ten census tracts are classified from low to very low on the socioeconomic scale and are situated primarily west of Interstate 15 adjacent to the western edge of the C.B.D., and extending in wedge-like fashion to the northwest. Three census tracts classified among the "low value" neighborhoods are located east of and adjacent to the central business area (Fig. 3).

Careful study of the distribution of general and violent crime compared to the neighborhood analysis shows that high crime areas do not coincide with either "high value" or "low value" neighborhoods. The conclusion that can be drawn from these patterns is that crime is spatially associated with the major business areas of San Bernardino. Although this finding seems logical it has often been overlooked or relegated to a position of little importance by scholars doing research on urban crime patterns, with ethnic or poverty measures given more attention.

REGRESSION ANALYSIS

A stepwise regression was done in order to test the significance of the relationship between crime rates and several variables hypothesized to be generators of crime (Table 2). In the study of general crime four variables are significant at the 0.99 level of confidence. Rates of violent crime and percent naming Spanish as their native language are positively related to general crime, while median home value and percent younger than eighteen years are negatively related. In the case of violent crime; general crime, percent of population sixty-five years or older, and Spanish as native language are all positively related and significant at the 0.99 confidence level. Residence the same in 1970 as 1965, percent of population eighteen and younger, and high school graduates are significant at the 0.95 level. The latter two variables are negatively associated with rates of violent crime.

From these results no cause and effect relationships are drawn. The significant variables are spatially related to general and violent crime but this does not mean that Spanish speaking persons with a record for violent crime and coming from low value homes are singled out as the general crime element. Neither do I deduce from these results that one base the average violent crime profile on a sixty-five year old or older Spanish speaking person who has an arrest record for general crime, has not changed residence since 1965, and did not graduate from high school. It is suggested that these variables indicate persons that have the least choice in residential location due to their social and economic status, and therefore are relegated to the older homes surrounding the central business district which places them in the census tracts where the highest crime rates occur. I also believe that too much attention has been given to what correlates with crime and not enough study to what really causes crime. In other words, does a person steal because they did not graduate from high school or because they speak Spanish, or is it that these people have been less able to compete in our society and turn to criminal acts to gain social and economic viability.

TABLE 2
Variables in Regression Analysis

X ₁	- Percent Black population
X ₂	- Percent sixty-five years and older
X ₃	- Percent eighteen years and younger
X ₄	- Percent naming Spanish as native language
X ₅	- Percent with high school education
X ₆	- Percent in same residence in 1970 as 1965
X ₇	- Percent unemployed
X ₈	- Mean income
X ₉	- Percent on welfare
X ₁₀	- Percent below poverty level
X ₁₁	- Percent of houses with more than one person per room
X ₁₂	- Median home value
X ₁₃	- Rate of violent crime
X ₁₄	- Rate of general crime

Analysis of Residuals

In spite of relatively high coefficients generated by the regression model, the mapped distributions of violent and general crime and neighborhood types indicate that crime cannot be fully explained by socioeconomic variables (Fig.'s 1, 2, and 3). For this reason I mapped the residuals and attempted to interpret the underpredicted and overpredicted areas. Ideally, there will be patterns formed by the residuals which suggest other variables

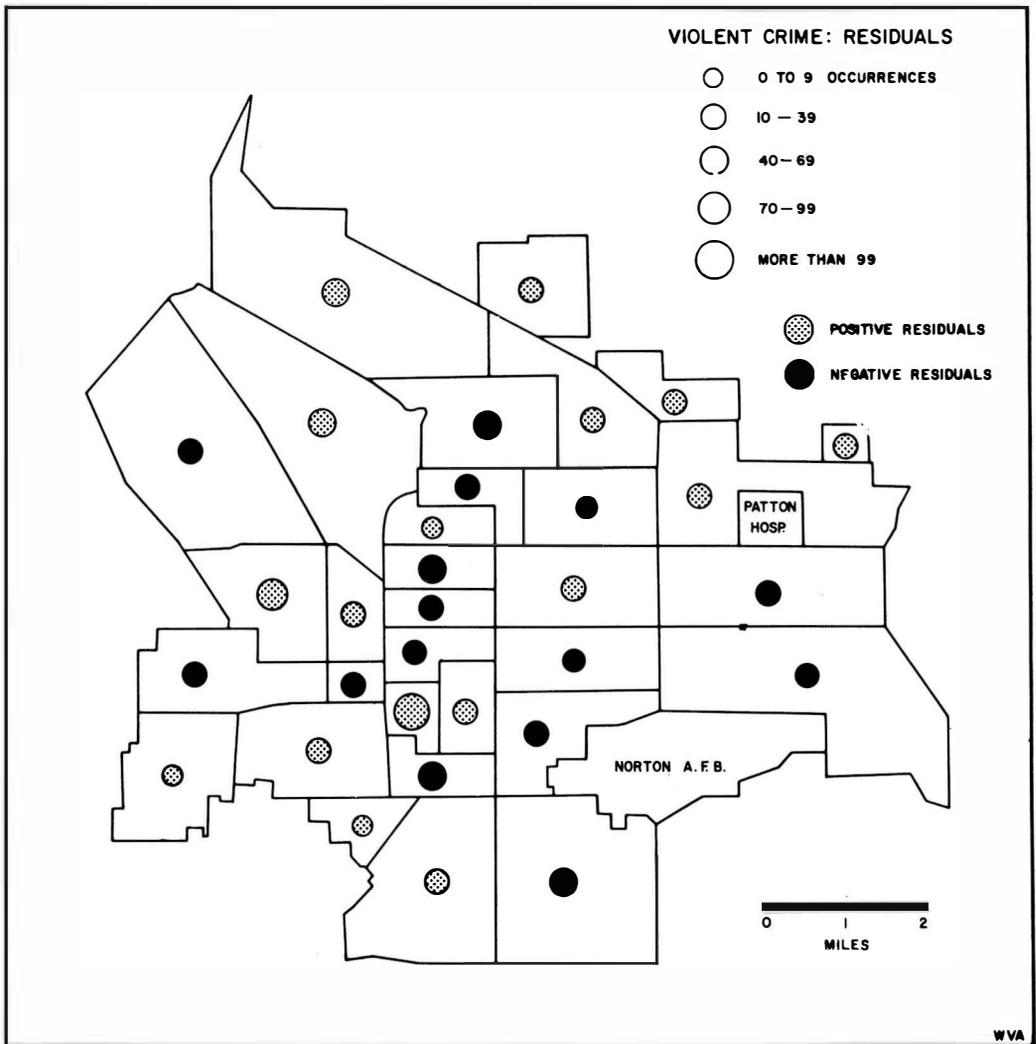


Figure 4. Residuals of Violent Crime in San Bernardino, California

perhaps more truly related to the distribution of crime.

Given the socioeconomic character of the regression model negative residuals are expected in very low income areas and positive residuals in high income areas. This pattern is generally substantiated on our plot of residuals for violent crime (Fig. 4). However, not all upper income areas are overpredicted and not all low income areas are underpredicted. The pattern which emerges is that low income areas with business districts are overpredicted while high socioeconomic areas with major business activity are

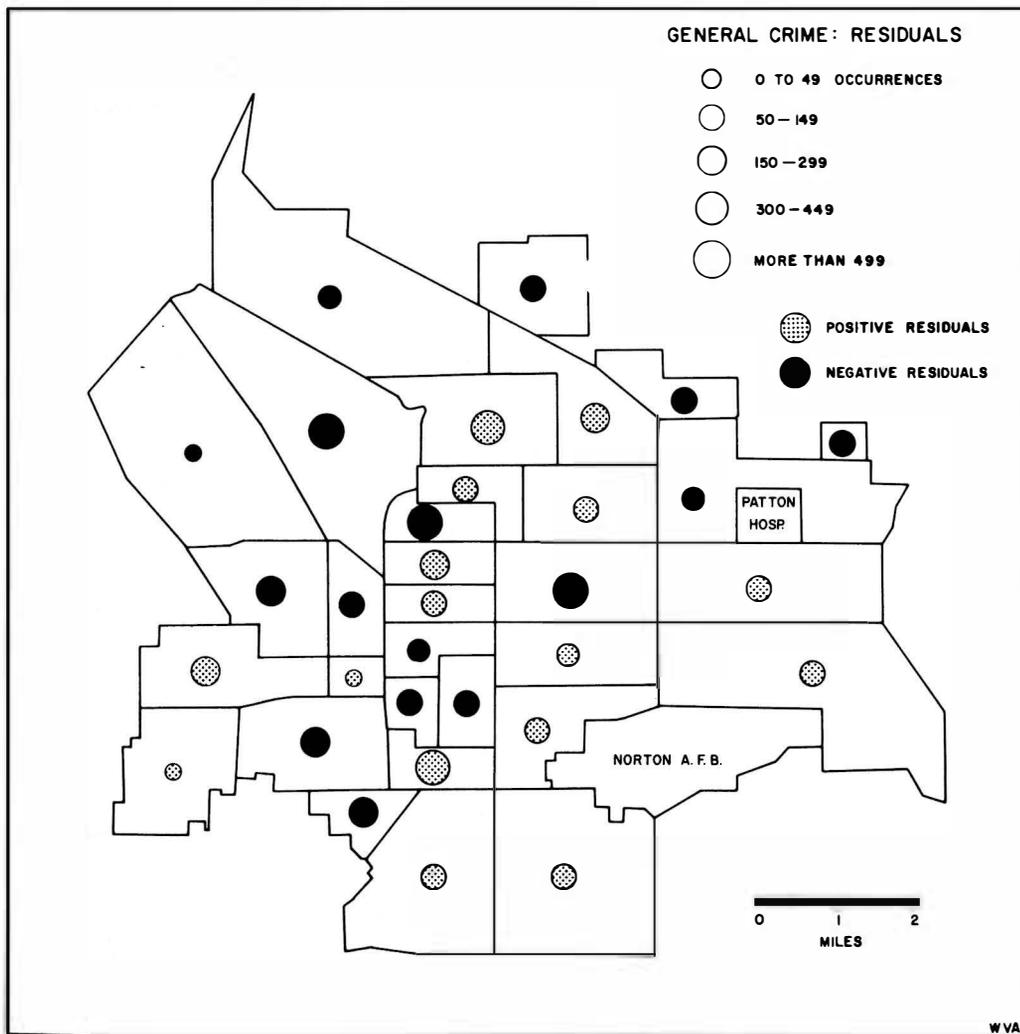


Figure 6. Residuals of General Crime in San Bernardino, California

underpredicted. This indicates that perhaps the inclusion of a variable such as the volume of retail sales could reduce the residuals. The empirical evidence plotted on Figures 1 and 2 further substantiates this finding and indicates the importance of the location of business activity to the location of criminal acts.

The distribution of residuals for general crime does not lead itself to easy interpretation. High income neighborhoods are expected to be overpredicted and low income areas to be underpredicted due to the socioeconomic character of the model. However, the highest income residential areas of the city are underpredicted. Two of the three census tracts that comprise the lowest income area of the city are underpredicted while the third is overpredicted. The latter is understandable as it is in an area with considerable business activity. However, in the case of general crime there is no consistent relationship between business areas and the predictive capability of the model. Both high and low income areas are overpredicted and underpredicted. In this instance residuals do not suggest alternative explanatory variables (Fig. 5).

SUMMARY - CONCLUSIONS

Findings indicate that although high violent and general crime rates are not located precisely together both are concentrated in the central business district of San Bernardino. The high crime areas are nearest to the low income parts of the city which nearly surround the C.B.D. High income neighborhoods are separated from the central business district and high crime areas by a buffer zone of middle income neighborhoods. There is a crime gradient which is highest at the center and declines as distance from the C.B.D. increases to reach a city low in the highest income residential districts to the north and northeast. Socioeconomic variables alone do not adequately explain the distribution of crime. Analysis of residuals suggests a relationship between violent crime and the distribution of business areas.

It is concluded that the most important factor in the

distribution of crime in San Bernardino is the location of areas where the opportunity for crime is the highest. Thus the major crime areas coincide with business districts. Crime is not concentrated in poor areas of the city as there is little to steal, nor in high income neighborhoods where property is often more carefully protected. My findings indicate the police protection could be highly concentrated in certain relatively small "high risk" areas. It is also apparent that urban renewal has not solved the crime problem in downtown San Bernardino. Perhaps the location of new shopping malls in C.B.D. areas brings lucrative crime targets, both businesses and people, into closer contact with the crime element. These findings are of obvious importance to urban planners.

There is still much research to be done on this problem. Scholars need more and better data including crime locations by city block and the area of residence of the criminals. Experimentation with alternative means of measuring crime distribution would be valuable. With data improvements better understanding should be possible.

NOTES

¹An excellent review of pertinent literature can be found in Keith D. Harries, *The Geography of Crime and Justice* (New York: McGraw-Hill, 1974).

²Clifford R. Shaw, et al., *Delinquency Areas* (Chicago: University of Chicago Press, 1929); Clifford R. Shaw and Henry D. McKay, *Juvenile Delinquency and Urban Areas* (Chicago: University of Chicago Press, 1942).

³Shaw and McKay, p. 158.

⁴Calvin F. Schmid and Stanton E. Schmid, *Crime in the State of Washington* (Olympia: Law and Justice Planning Office, 1972). See also, Calvin F. Schmid, "Urban Crime Areas: Part I," *American Sociological Review*, Vol. 25 (1960), pp. 527-42; and Calvin F. Schmid, "Urban Crime Areas: Part II," *American Sociological Review*, Vol. 25 (1960), pp. 655-78.

⁵*Report of the President's Commission on Crime in the District of Columbia* (Washington: U.S. Government Printing Office, 1966), pp. 12, 140-41.

⁶Yuk Lee and Frank Egan, "The Geography of Urban Crime: The Spatial Pattern of Serious Crime in the City of Denver," *Proceedings, Association of American Geographers*, Vol. 4 (1972), pp. 59-64.

⁷For a more complete discussion on crime reporting see Walter C. Reckless, *The Crime Problem* (New York: Appleton, Century, Crofts, 1967), pp. 77-78.