

Crime and Neighborhood Characteristics: A Case Study of South Bend, Indiana

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Abstract

Compared with the national crime rate, the City of South Bend has an extraordinarily higher crime rate for crime against person and crime against property. This project is designed to have a longitudinal study of the patterns and trends of crime in South Bend from year 2000 to 2005 via tools of the Geographic Information Systems. Specifically, this project will examine geographic variations of crime over time, the relationship between index crime and neighborhood characteristics.

Introduction

Crime in the U.S has undergone a gradual decline from the mid 1990s to the early 2000s. This declining crime trend has been evidenced by data from Federal Bureau of Investigation's Uniform Crime Report (UCR, 2005) and National Crime Victimization Survey (NCVS, 2005). The actual crime rates in different states and cities, however, vary dramatically from the national average. The city of South Bend, Indiana, for example, has a notable higher crime rate compared with other Midwestern cities of similar population size (see Appendix I). The higher crime rate in South Bend poses many questions to be answered: What are the factors that affect the higher crime rate in South Bend? Are there any geographic variations among the city's crime? If so, how do these patterns vary over time? By exploring these questions using GIS (Geographic Information Systems) software, we will analyze the city's crime pattern, spatially and temporally, and propose some solutions to reduce and prevent future crimes in the city.

Literature Review

Criminological research has highlighted several important factors related to the high crime rate in urban areas. Social ecology studies view crime as a function of the ecology of a neighborhood and the cultural adaptations people make to the neighborhood characteristics. The early study of urban crime by Park and Burgess (1925) found that crime tend to be concentrated in certain areas of the city, known as the hot spots, where there are higher poverty and crime. Shaw and McKay (1942) argue that the relationship between poverty and crime can be explained by looking at the effects of poverty on other important neighborhood characteristics, such as population composition and residential mobility. They classify the urban area into five different zones and point out that the

crime gradually decreases from the center of the city to the suburb area. In areas where there is rapid population mobility and diverse ethnic composition, known as the transitional zone, there will be more crime. The transitional zone can also be characterized by other factors such as physical decay of the neighborhoods, high percentage of lower-class families and single-parent households. Due to these characteristics, residents in the socially disorganized neighborhood cannot develop an effective control of social order; hence there are high rate of crime and delinquency. Consequently, there is a value system developed in those areas that tolerates delinquency and crime as normal parts of the residential life.

Wilson (1987) also focuses on the social and economic conditions in the poor neighborhoods that are correlated with concentrated crime. His finding suggests that deteriorated social economic conditions and limited opportunities create settings for all types of delinquency and crime as residents in the poor areas suffer from social and cultural isolations and inadequate social capital from mainstream culture. The interactions between criminal victimization and offending thus contribute to a vicious cycle of violence as residents with limited resources gradually make adaptations to deteriorated neighborhood conditions and become more tolerant of using violence as means of solution to daily problems (Sampson and Wilson, 1995; Andersons, 1999).

The contemporary studies of urban crime, on the other hand, tend to focus on the indirect effect of social economic factor on neighborhood crime rate. Specifically, researchers have been focusing on the community's ability to control crime and the effect of informal social control on crime. Research has shown that although neighborhood social economic status affects informal social networks and interaction of residents,

which in turn, affect variations in crime (Bellair, 1997). Bursik and Grasmick (1993) find that in neighborhoods of an immobile underclass population, there is inadequate informal social control, which partially explains the concentrated crime in those neighborhoods.

Other studies have shown that younger minority population of lower social economic status, are disproportionately involved in crime and are at highest risk of criminal offending and victimization. Sampson and Wilson (1995) highlight a cycle of crime which explains the high crime rate in poor inner city. The cycle begins when affluent residents together with industry and business move out of the inner city. This exodus leads to greater urban decay and other conditions of social disorganization including: a sharp increase in unemployed rate, people living in poverty, illegitimate births, single parent families, drug abuse and violence. With the decline of economy in the neighborhoods, social institutions including churches, schools, stores, health care and recreational facilities, decline as well. This decaying process results in inadequate informal social networks and creates opportunities for delinquency and crime (Wilson and Kelling, 1982). Other factors, such as residents' fear of crime, fear of encounter with the police and gang activities in the neighborhoods, make it more difficult to have an effective crime prevention and control.

In sum, previous researches of urban crime suggest that social, economic factors create variations of crime concentration. The neighborhoods with concentrated poverty, high population mobility and inadequate informal social network will have a consistent concentration of crime over time.

It is very important, therefore, to identify the characteristics of neighborhoods in order to understand the crime of a city. All social-economic factors and crime have a

spatial dimension. GIS, as a tool in analyzing spatial patterns and structures, should play a significant role in crime pattern and crime trend study. In fact, the recent applications of GIS in crime analysis have greatly enhanced the effectiveness of crime prevention and control in many urban areas. Many cities have adopted various platforms of geographic information system as an important component in policing and crime prevention (Chainey and Ratcliffe, 2005). Meanwhile, studying the temporal and spatial changes of those influencing factors and presenting them in a straightforward mode will help to enhance the efficiency and effectiveness of policing and crime prevention. In this paper, we will identify hot spots of crime in South Bend, Indiana, and examine the relationships of neighborhood characteristics with crime concentration over time.

Data and Methods

Data

The analysis of this project will be based on ArcGIS 9, a GIS software from the Environmental Systems Research Institute (ESRI). Two types of data are used in the project. Spatial data that provide geographic information about South Bend, such as roads, rivers, census tracts 2000, are derived from US Census Bureau's TIGER database. Additional spatial data, such as aerial photos, are downloaded from the Indiana Spatial Data Portal (ISDP) managed by Indiana University (<http://gis.iu.edu/>).

Attribute data that describe neighborhood characteristics such as population composition, social economic status are obtained from ESRI's Community Info for Education data set. The crime data that contains the police arrests records are collected from South Bend Police Department. This data set contains counts of arrests, arrest addresses, and crime types including Part I offenses (murder, rape, robbery, aggravated

assault, burglary, larceny, auto theft, and arson) and Part II offenses (forgery, fraud, embezzlement, vandalism, weapons violations, sex offenses, drug and alcohol abuse violations, gambling, vagrancy, curfew violations, and runaways). Due to the process of data collection and consolidation, there is a time lag between the data collection and the availability to the public. The latest available data are as of September 2006. For the convenience of making yearly comparison, this project will be based on crime data from 2000 to 2005. In the analysis, only Part I offenses, which includes the most serious violent and property crime (known as index crime) are used.

Analytic Strategy

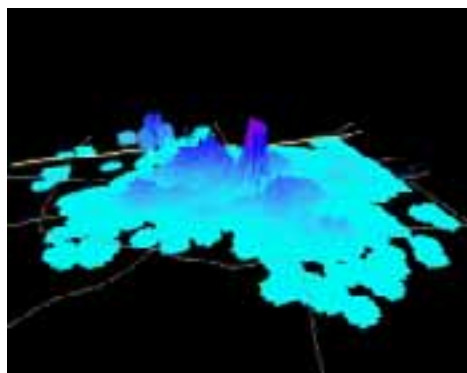
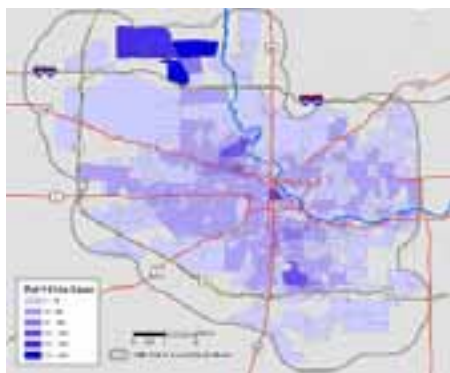
Before the analysis, crime data which contains arrest addresses are first geocoded into points in Arc GIS. A series of crime maps are generated. Hot spots maps of Part I offenses over time are then produced.

The second part of the analysis is focused on the relationship between crime and neighborhoods characteristics. The scale-level of the neighborhood is based on the census block. Neighborhood characteristics such as median age, racial composition, household income, poverty rate, and home ownership are also mapped. By comparing neighborhood maps with crime maps, we can examine whether the concentrations of violent and property crimes are related to neighborhood characteristics.

In the third part of the analysis, the proximity of violent and property crime to schools and risk factors for the youth population are examined.

Results

The first part of our analysis examines the distribution of index crimes from 2000 to 2005 and the variability of crime concentration from 2000 to 2005. Graph 1 shows the distribution of index crimes from 2000 to 2005 at the Census Block level.



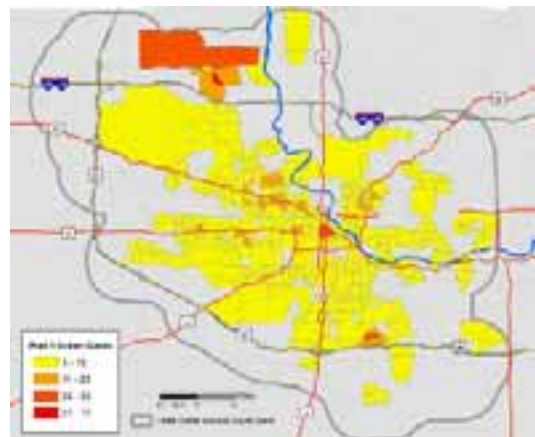
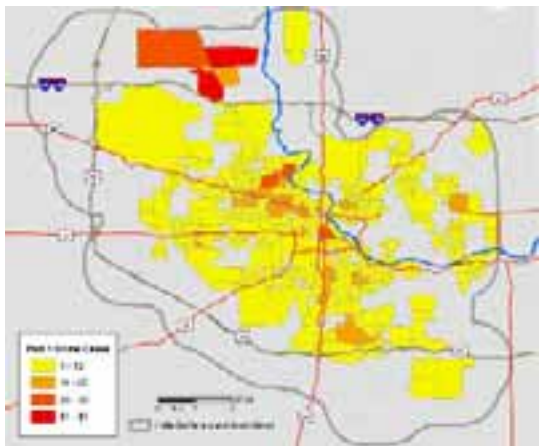
Graph 1. Index Crimes at Census Block Level, 2000-2005

Graph 2. Index Crimes in 3D View, 2000-2005

From this graph we can see that index crimes are concentrated in four different areas, including neighborhoods bordering south downtown area, areas bordering northwest part of the downtown areas, northwest region of South Bend north of Interstate Highway 80/90, and areas in the south part of the city north of Indiana State Route 20. There are more index crimes recorded at the west part of the city than the east, and the northeast part of the city has the least number of crime cases from 2000 to 2005. Overall, the distribution of index crimes is consistent with prior findings from the social ecological research of urban crime. That is, index crimes gradually decrease from the center of the city to the suburban areas. Graph 2 presents a 3-D view of this distribution pattern from 2000 to 2005. One exception to this pattern, however, is the concentration of crime at the northwest region of the city.

Graph 3 and Graph 4 present the distribution of index crimes in 2000 and 2005

respectively. In 2000, index crimes are concentrated around downtown areas and the northwest areas of South Bend. Neighborhoods west of downtown areas have comparatively higher number of crimes than other urban areas. Two areas in the south and in the east also have higher number of index crimes than surrounding neighborhoods. In Graph 4 we can see some changes in the distribution of index crime from 2000 to 2005. In 2005, there are decreased number of index crimes in some areas of the city, including the east areas, the south areas along State Route 33, and areas bordering the northwest downtown area. Although index crimes are still concentrated in the northwest region of the city, the number of crime decreased as well. Meanwhile, in 2005, a small area in the south part of the city north of State Route 20 observes increased number of index crime.



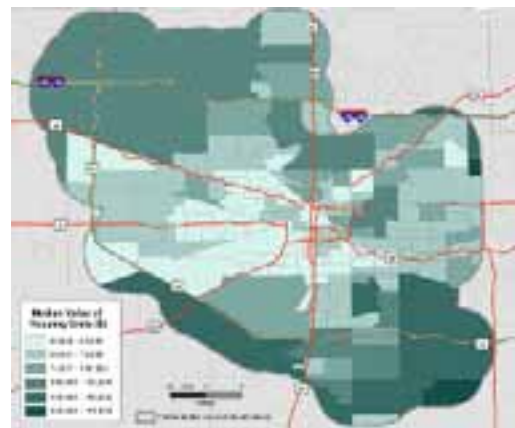
Graph 3. Index Crimes at Census Block Level, 2000 Graph 4. Index Crimes at Census Block Level, 2005

In the second part of the analysis, we examine the relationship between neighborhood characteristics and crime distribution. Graph 5 shows the percentage of households whose income level were below poverty level in 2000. Areas around downtown, northeast areas north of State Route 23 and west central parts of the city have higher percentage of poverty level compared with other areas. Comparing Graph 5 with Graph 3, we find that there are overlaps in the concentrations of poverty and index crime

at downtown areas, west central areas and south areas of the city. This supports the proposition that there is close relationship between poverty and concentration of urban crime. We also observe some exceptions here. For instance, in the northwest region of the city where there is a lower level of poverty, there is a higher level of index crimes. In the northeast part of the city where there is a higher level of poverty, there is no concentration of crime.



Graph 5. Household Income below Poverty Level, 2000



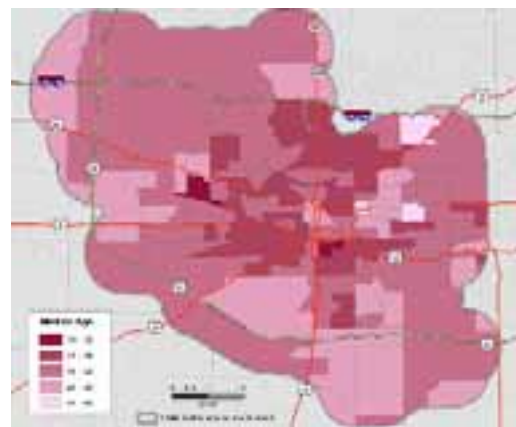
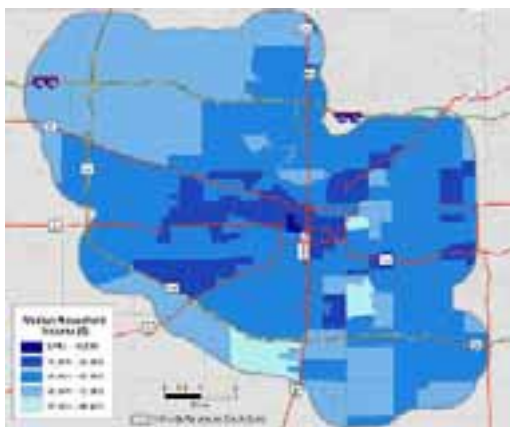
Graph 6. Median Value of Housing Units, 2000

In Graph 6, we examine the median value of housing units in 2000 and explore its relationship with distribution of index crimes. In general, the northwest areas and the southeast areas have higher value of housing units than other areas of the city. The west central areas of the city have the lowest housing value compared with other areas. When we compare Graph 6 with Graph 3, we find that nearly all the concentration of crime fall within areas with lower value of housing unit, with the exception of the northwest region where the value of housing unit is high but there is a concentration of crime.

We continue to examine the relationship between household income and crime concentration. Graph 7 shows the median household income in 2004. In general, the northwest areas and the south areas have higher household income than other areas in

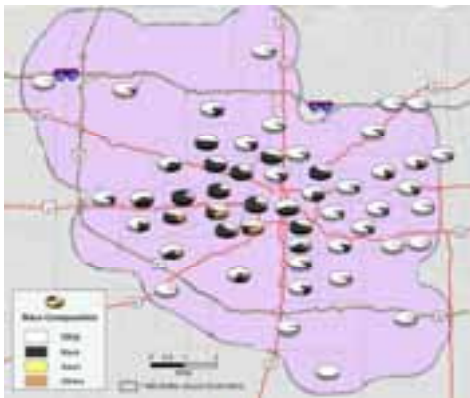
South Bend. When we compare Graph 7 with the distribution of crime in 2005 (Graph 4), we find that nearly all the areas with higher levels of crime fall within areas with the lowest household income. Again, the exception is the northwest region where there are high levels of index crime and higher levels of household income.

Next, we are going to examine other demographic characteristics of the neighborhood, such as age and racial composition and explore their relationships with the distribution of index crime in South Bend. Graph 8 shows the median age of South Bend residents in 2004. It shows that younger population lives closer to the central areas of the city than older population. In some areas, such as the west central areas and the south downtown areas, residents are younger than residents in other areas of South Bend. Comparing Graph 8 with the crime map in 2005 (Graph 4), we find that concentration of crime in 2005 tend to be within areas with a younger population. In particular, areas with a median age of 21-30 tend to have higher number of crime cases than other areas. This finding is consistent with prior findings about the inverse relationship between age and crime based on aggregate data.

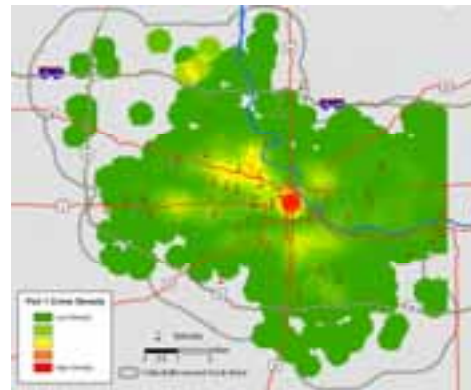


Graph 7. 2004 Median Household Income at Census Block Group Level. Graph 8. 2004 Median Age at Census Block Group Level

Graph 9 presents the racial composition of South Bend residents in 2000. In general, there is more racial diversity among residents living in the central part of the city and there are more minorities living in the west central areas of South Bend. Comparing Graph 9 with the map of crime distribution in 2000 (Graph 3), we find that in areas where there is more racial diversity, there are higher levels of crime concentration. In the west central areas where the majority of the population are African American and Hispanics, there are more crime cases than other areas of the city.



Graph 9. Race Composition of South Bend at Census Tract Level, 2000



Graph 10. Index Crime Density, 2000-2005

Finally, we examine the proximity of crime to schools in the city of South Bend. Graph 10 shows a crime density map from 2000 to 2005. Over the years, downtown area has the highest crime density. Notably, many of the public schools in South Bend are located within areas of higher levels of crime density. This result suggests a potential problem for the already vulnerable youth population who are more likely to be both offenders and victims of violent and property crimes.

Discussions

Identifying the spatial and temporal change of crime is one of the major focuses of this paper. Although our initial analysis has found some changes of the distribution of

crime from 2000 to 2005, we have also identified some consistent patterns in the distribution of index crimes over the years. In the city of South Bend, the northwest areas near the city limit, southern downtown areas and the west central areas consistently have a higher number of index crimes than other areas of the city. In order to explore factors that contributing to the concentration of crime, we have also examined the relationships between neighborhoods demographics and crime concentration. Our findings provide support to the theoretical account of social disorganization theory on urban crime. Index crimes tend to concentrate in areas with higher levels of poverty, lower median household income and lower housing value. Higher numbers of index crimes are also observed in areas with a younger population and areas with a diverse racial composition. In addition, analysis of crime density shows that a number of public schools at the west central areas are within close proximity to hot spots of crime. These findings should provide implications for policies of crime prevention and crime control regarding how to address consistent concentrations of crime and how to prevent crime in high-risk areas.

Nevertheless, the theoretical proposition of social disorganization theory and social ecological view of urban crime would not adequately account for all aspects of index crimes in South Bend. For instance, these theoretical perspectives cannot explain why there are concentrated crimes in the northwest area of South Bend, where the majority of the residents are affluent, older and where there are fewer minority residents. Alternative explanation, such as the routine activity theory (Cohen and Felson, 1979), which focuses on the combination of availability of suitable targets, absence of capable guardian and presence of a motivated offender, seems to be more suitable to explain the concentration of crimes in the northwest areas of South Bend. In fact, the characteristics of the

northwest area of South Bend contribute to its unique crime problem. First, there are two industrial parks in the areas together with several large shopping malls, which are characteristic of high population mobility. Second, the wealthy residents and affluent neighborhoods are more likely to attract potential criminals. Third, this area is adjacent to interstate highways and borders the State of Michigan, which makes it easier for a criminal to get away. Considering all these factors together, routine activity theory seems to provide insights for situational prevention of crime in the northwest area of South Bend.

All the findings, however, should be interpreted with caution due to some problems with the data. First, all information of crime address are based on arrest records from the police department. Although this may not happen, there may be potential bias in the official crime records. Factors such as increased surveillance in certain neighborhoods, discretion of police officers can affect the geographic distribution of recorded crime. Second, there may be errors in recording crime address. For instance, in our initial analysis, we have identified some hot spots of crime which turn out to be a product of data entry convention by the police department. We identified a concentration of crimes at an address where a police unit dealing with homicides and violent crimes is located. Some of the violent and homicide offenses only have the address of that special police unit, while there is no accurate address information for those crimes. Similar problem were examined throughout our analysis. Once we identified such problems, we excluded those addresses from the analysis. These potential threats to research validity should be acknowledged when we interpret the findings.

Appendix I. Comparison of Index Crimes in Selected Midwest Cities

City	Rate Per 100, 000	Population 2005	Violent crime	Property crime	Total
Independence (MO)	8030	111,905	796	8,190	8986
South Bend (IN)	6980	106,076	794	6,612	7406
Gary (IN)	6020	100,065	718	5,310	6028
Columbia (MO)	3920	90,304	477	3,065	3542
Green Bay (WI)	3370	101,599	495	2,931	3426
Kenosha (WI)	3340	94,261	249	2,899	3148
Ann Arbor (MI)	3290	113,660	358	3,379	3737
Livonia (MI)	2500	99,017	170	2,301	2471
U.S	750	296,410,404	603,503	1,609,327	2,212,830

Source: Uniform Crime Report 2005.

Note: Violent crimes are offenses of murder, forcible rape, robbery, and aggravated assault. Property crimes are offenses of burglary, larceny-theft, motor vehicle theft, and arson.

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