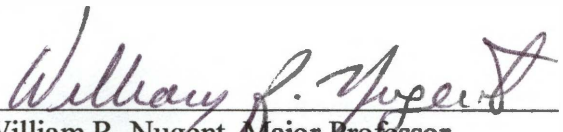
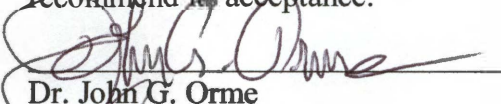


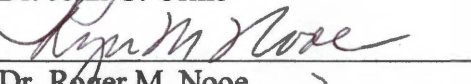
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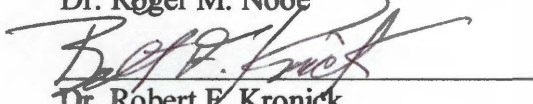
I am submitting herewith a dissertation written by Sylvia Jane Sergent entitled A Criterion Validity Study Of Individuals' Reports Of Gunfire And Recorded Gunfire. I have examined the final paper copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Social Work


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A CRITERION VALIDITY STUDY OF INDIVIDUALS' REPORTS OF
GUNFIRE AND RECORDED GUNFIRE

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Sylvia Jane Sargent

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DEDICATION

With most sincere gratitude and thanksgiving, this dissertation is dedicated to the following people. Each made a profound contribution to the quality of my life. I am thankful my Mother had the gift of seeing goodness and strength in the most unlikely situations and people. I am thankful my Dad had the ability to immerse himself in goodness and peace while coping with his illness and departure. I am thankful Dr. Richard Yoakley had the ability to nurture people's lives. I thank Dr. William Nugent for his ongoing gift of extracting and building something good and true from his students' abilities.

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ABSTRACT

The focus of this study was the validation of people's reports of gunfire in two inner city neighborhoods in the Southeast. A survey design was used in which 342 people were interviewed by telephone. An ARIMA analysis was conducted to determine the relationship between people's gunfire reports and 58 days of ShotSpotter recordings. The results indicated that the percentage of residents reporting the presence of gunfire was a valid predictor of night gunfire. However, residents' reports of the actual number of gunshots did not appear valid. Reports of gunfire did not appear to have a statistically significant correlation with 911 gunfire calls. Residents (96.7%) indicated that gunfire had bothered their sleep. People's reports of gunfire appear to be one indicator of community violence.

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LIST OF ABBREVIATIONS

ARIMA	Autoregressive Integrated Moving Average
CHA	Chicago Housing Authority
CDC	Centers for Disease Control and Prevention
HUD	Housing Urban Development
PD&R	HUD Office of Policy Development & Research
PHDEP	Public Housing Drug Elimination Program
NCVS	National Crime Victimization Survey
UCR	Uniform Crime Report
VSPHR	Victimization Survey for Public Housing Residents

CHAPTER 1

Introduction

In working as a school social worker, I gained a new perspective on the everyday community life of some children. The children lived in a relatively small public housing development about seven miles from my home. The school social work position was the result of a government grant to assist children in becoming academically successful. My personal emphasis was working with kindergartners and first graders. The goal was for children to gain a good foundation for later academic work. The children referred from the kindergartner classes were different from the older, often defiant adolescents I had frequently worked with in years past. They enjoyed hearing stories and playing with the stuffed animals in my office. A common occurrence was to have a kindergartner teacher ask me to work with a particular child because he was having trouble paying attention to class work. The following is a modified brief account of children's communication that had a major impact on my direction in social work. The account is also the basis for questions addressed in this paper.

Two five-year-old boys were meeting with me in my office. This was their third visit. My standard routine was to do calming activities with the children and reintegrate them back into the classroom. Following these types of activities, teachers reported that children were calmer for the remainder of the day, so this seemed like a somewhat successful intervention. On this particular day, I was not prepared for dealing with the material in the little boys' discussion. The children began talking about the gunshots they had heard the previous night. One child told the other boy that it was firecrackers. The boy said it wasn't firecrackers. The other child acknowledged that he knew it was gunshots but he told himself it was just firecrackers. The children proceeded to talk about a man being shot on a neighbor's front porch. One child seemed convinced that parts of the dead man's brains were washed off the porch. My thought was that both of these boys must be making up these stories. My house was only a few miles away, and we do not have any problems like this. Also, all of us live in a relatively safe, mid-sized city. This is not Chicago. I thought the children must be watching too much TV.

Further discussion with parents and grandparents living in the community indicated that the children were not making up the stories and that they too often had trouble sleeping because of gunfire. Their stories were real, not made-up. They were bright, caring children, and they were busy trying to make sense of the violent conditions around them. I did not consider it acceptable only to do calming or socialization activities with someone living in this situation. Only dealing with the symptoms of a violent community seemed very inadequate.

Upon further investigation, studies by Garbarino et al. (1991) indicate that many housing developments in large inner cities are "no place to be a child." Listening to gunfire at night is part of children's daily lives. Children have more pressing concerns than learning consonant sounds. They are often afraid at night and they also worry about the safety of other family members. The 1999 HUD report on gun-related crime indicates that people residing in public housing are over twice as likely to suffer from firearm-related victimization as other members of the population. The report also indicates that public housing residents cite gunshots as a major crime problem. Over 50

percent of the residents of larger public housing authorities list gunshots as a major problem in the community. The report further states that whether or not the fears regarding gunfire are warranted, the perceptions have a direct impact on the sense of community in public housing developments and their surrounding neighborhoods (HUD, 1999).

Further review of community research indicates that the problems discussed by these children are not unique to their public housing development. The following is a review of what we know about gunfire and violence in public housing developments and an overview of community violence in general.

Prevalence of Community Violence

Community violence has a major impact on the lives of many children living in the United States. In the 1993 report Losing Generations by the U.S. National Research Council on Adolescents in High-risk Settings, researchers state that people must reduce the exposure of children and adolescents to high-risk settings. The council states that reducing the risks generated by violent settings is a

precondition for reducing many health and life compromising behaviors of children. Fortunately, the 1997 "Juvenile Justice Update on Violence" indicates that the wave of violence is decreasing; however, the levels are still alarmingly high. Bilchik, U.S. Office of Juvenile Justice and Delinquency Prevention, states that the forces that were responsible for the decade-long increases in juvenile violence are still with us, but may now be better able to counteract them. The 20% decline in murders by juveniles between 1993 and 1995 is encouraging. Still, in 1996, 19,645 people were murdered by adults and juveniles (UCR, 1997). Between 1985 and 1995, 25,000 juveniles were murdered in the United States.

Heterogeneous Distributions of Community Violence

For some young people, community life is not a safe place for physical growth. In 1995, 72% of the juveniles murdered were male, 31.7% were 16 or 17 years of age, and 83% of older murdered juveniles were killed with a firearm (U.S. Office of Juvenile Justice and Delinquency Prevention, 1997). Presently, homicide is the leading cause of death for Black males aged 15 to 34 and the second leading cause

of death for people between 14 and 34 (Center for Disease Control, 1998). This level of violence is not representative of other developed countries. The homicide rate for males between 15 and 24 years of age in the U.S. is 28 times higher than the rate in Germany, 15 times higher than in Australia and 10 times higher than in Canada (World Health Statistics Annual, 1994). On average, the homicide rate in the United States is 3 to 4 times greater for white young people and 7 to 8 times higher for black youth than the homicide rate in other developed countries (Center for Disease Control, 1994). The firearm mortality rate in the United States is 14.24 per 100,000, significantly greater than the rate of 0.13 in Asia (Powell & Dahlberg, 1998).

One of the reasons it is easy to underestimate the seriousness of community violence is that most of the people discussing issues of community violence live in safe neighborhoods. As noted by William Thomas, attitudes influence social institutions and the resulting actions (1923). It is important that people discussing community violence give voice to people that are impacted by high levels of community violence. Ongoing high levels of community violence are not the norm. In 1995, 84% of the

counties in the United States recorded no juvenile murders. In 9% of the counties, one juvenile was murdered. Ten counties accounted for over a third of the murdered juveniles in the United States. Twenty-five percent of all known juvenile homicide perpetrators were reported in Los Angeles, Chicago, Houston, Detroit, and New York City. A closer look at the data isolates certain neighborhoods within the counties where the murder rate is highest (U.S. Office of Juvenile Justice and Delinquency Prevention, 1997).

Many children do not live in safe neighborhoods, but community violence is not uniformly spread over the United States. Public housing developments in Detroit, New York and Chicago are home to thousands of children, but some are among the highest crime communities in the world. Garbarino et al. (1991) state that the magnitude of environmental danger in some public housing developments is equaled only by the level of community violence in locations involved in armed conflict. In a study conducted by the National Institute of Justice in 10 high crime inner city schools in Illinois, Louisiana, New Jersey, and California, researchers reported that one in three males in the tenth grade had been

shot at with a gun, stabbed with a knife or otherwise injured with a weapon at school or in transit to or from school. Furthermore, forty percent of the students reported that male relatives carry guns in the community (1995). Since the research was not based on probability sampling and participation was voluntary, the findings may not be representative of the community. The findings do indicate that for many of the 1,591 young people in the study, community life is not safe.

Impact of Community Violence

The human pain experienced by people due to community violence is beyond current measures. The exact costs of community violence for medical care, rehabilitation, lost jobs, and educational productivity are not known. No national registry exists for reporting all gunshot wounds caused by assaults. The Centers for Disease Control and Prevention have collected data on nonfatal gun-related injuries from a sample of 91 hospitals in the United States since 1992. In their study, little information is available about the event or type of weapon used (Zawitz, 1996). In a study by Cohen and Miller, the estimate for firearm assault

costs for injury and death in the U.S. was \$63.4 billion in 1992, with costs for medical care, mental health services, emergency transport, insurance administration, and police services included (1995). Another estimate for the cost of firearm injuries is over \$20.4 billion in costs for hospital, medical care, long term disability and premature death, with 80% of the cost paid by taxpayer dollars (Rice, 1993).

Impacting many children are the neurological and developmental consequences of living in an ongoing state of fear. Garbarino states that chronic community violence requires children to adjust developmentally in order to survive (1997). Friedlander indicates that a great societal problem is children being wounded by the trauma of community violence. Many are then left with impaired ability to maintain effective interpersonal relationships and reduced adaptive competence in educational performance and employability (1993).

Perry states that children are malleable rather than resilient, and community violence impacts the neurological development of many children (1997). Studies by Perry indicate that the brain organization of children raised in

an environment characterized by community violence develops a stress-response apparatus that is excessively active and reactive. He states that for some children a physical change within the child's brain occurs that results in an altered cortical modulation ratio and a resulting predisposition to behave in an impulsive, aggressive, reactive manner. Furthermore, the neurodevelopmental adaptation to the ongoing low level of fear impairs a child's ability to learn in a classroom setting. Sometimes this results in Wechsler Intelligence scores that are similar to those of children considered learning disabled (1997). A methodological weakness of the research is very small sample size. Also, there is a scarcity of longitudinal studies on the impact of experience on neurological development.

Studies by Pynoos & Eth (1985) and Pynoos (1990) have also indicated that children in a violent, chaotic environment become hypervigilant with cognitive distortions and behavioral impulsivity. The research in this area is very limited. Compounding the observance of causal relationships between learning difficulties and community violence are the often coexisting factors of major poverty

and parents' limited occupational success. Research design problems in studies of very poor, violent communities are addressed later in this paper.

Psychologically, Riechters and Martinez (1993), Osofsky (1997), Jenkins and Bell (1997), and Garbarino and Kostelny (1997) consistently report that exposure to violence is associated with distress symptoms in both younger and older children. Older children's symptoms of distress and depression are significantly associated with violent activity involving people they know. Their findings indicate that most violent activity reported by children involves people familiar to them. Research also indicates that psychological distress among high school students is as strongly correlated to a family member being victimized as to the adolescent personally experiencing victimization, regardless of whether the young person witnessed the violent incident (Jenkins & Bell, 1994).

Children 6 through 12 years of age also experience distress symptoms related to their parents' violent victimizations even though they have not witnessed the violent incidents (Dulmus, 1998). Several researchers state that children in violent communities witness many different

types of violence with the frequency of exposure to less severe types of violence being higher (Fitzpatrick & Boldizar, 1993; Richters & Martinez, 1993; Uehara et al., 1996). Osofsky indicates that in high crime areas, children are taught to sit with their heads below window sills and to run or dive when they hear gun shots. Very early in life children must also deal with loss and grief related to community violence (1993). In addition, Garbarino expresses concern for the parents and community adults exposed to community violence. Often, they are too frightened, preoccupied, or angry to help compensate for risk factors in the child's life. He theorizes that community violence often diverts and suppresses the abilities of adults to be psychologically available to children (1992).

DuRant, Cadenhead, Pendergrast, Slavens and Linder (1994) indicate that exposure to violence and victimization are the two strongest predictors of future use of violent behavior. Elliot's analysis of the National Youth Survey data indicates that the stability of social relationships and social contextual factors are the greatest indicators of maintaining aggressive-violent behaviors. He suggests that factors in the community such as employment and supportive

living arrangements impact whether or not young males transition into conventional adult roles or maintain involvement in violent behavior. Community factors, rather than some underlying predisposition for violent behavior, are considered the greatest indicators of a life of violent behavior. Elliot contends that in some poor neighborhoods, the dependence of some young males on gangs and an illicit economy makes transition into traditional adult roles very difficult. His research also indicates the importance of appropriate interventions with children before eleven years of age. For children initiating a serious violent offense before eleven years of age, 45% continued violent careers into their twenties (1994).

Research on Community Violence

Most of the limited research on community violence is conducted in areas with high murder rates. As stated by Richter and Martinez, although the murder rate has received nationwide concern and attention, it represents only a crude measure of the day-to day community violence characterizing many neighborhoods. In their measure of children's exposure to community violence, they include the child's experience

of witnessing as well as being a victim of shootings, assaults and physical threats, (1993). Most of the studies on community violence occur in high crime areas of Chicago, New Orleans, Washington, DC, Denver, and Detroit. Even less is known about community violence in public housing developments that do not have a high murder rate. The levels of community violence in inner city housing developments with lower murder rates have not been as well investigated as violence levels in areas with higher murder rates. Little is known about the impact of living in a moderately violent public housing neighborhood.

Tolan et al. indicate that there is a major need for more studies that can identify which characteristics and which indicators in a violent community influence child and adolescent development (2003).

Definitions of Community Violence

One problem in defining community violence is that there is no consensus regarding a definition of community violence. The operational definitions of community violence used by various organizations have serious implications regarding how much information is available on the scope and

incidence of community violence. For example, random gunfire is sometimes considered a major problem, but gunfire is rarely measured. The scope and incidence of random gunfire is therefore not known. Crocker and Algina (1986) state that before any measurement of a construct can be made, it is necessary to establish some rule of correspondence between the theoretical construct and observable referents that are legitimate indicants of that construct. Currently, different definitions of community violence use different observable referents as indicants of community violence.

Friedlander (1993) compares research on community violence to family violence research. He indicates that until researchers obtain the precision, scope, and data for community violence similar to that gained by the National Family Violence Survey described by Straus and Gelles (1990) it will not be possible to provide baseline data in the realm of community violence. Lorion and Salzman (1993) expect that with additional research on community violence regarding prevalence estimates and ethnographic data, it will be possible to organize a taxonomy of violent encounters. Garbarino has stated that in order to fully

understand the nature of community violence we need a "child impact analysis" that addresses all the facets of community violence (1991).

The most frequently quoted indicant of community violence used by researchers is the U.S. Department of Justice Uniform Crime Report on violent crime (Garbarino & Kostelny, 1997; Richters & Martinez, 1993; and Osofsky, 1997). The Uniform Crime Report (UCR) defines violent crime as composed of four offenses: murder and nonnegligent manslaughter, forcible rape, robbery, and aggravated assault. All violent crimes also involve force or the threat of force (1996). Certainly this is valuable information, but the UCR is making no attempt to define community violence. They report statistics on four areas of violent crime. Even though UCR statistics are frequently used to describe community violence, they are very clear about making no attempt to record the composite of all violent behaviors in a community.

Researchers use different operational definitions to define community violence. The operational definition used by Jenkins and Bell involves observing the actual location of violent behaviors and noticing whether people in the

community have the opportunity to personally witness the activity. For example, in Chicago in 1993, 56% of the city's homicides occurred in a "public way" (e.g., alley or street). The public nature of this activity makes the witnessing of violence more probable and increases a young person's chances of being an accidental or random victim (1997). The operational definition used by Richter and Martinez includes children's experience to witnessing as well as being a victim of shootings, assaults and physical threats (1993). The indicants studied by the Center for Disease Control involved injuries and deaths due to violence (1998). Important to this study is that all definitions of community violence include the presence of gunfire.

Definitions Used in this Study

The definition of community violence used in this paper is heavily influenced by Friedlander's concern regarding the major lack of research on community violence. He states that the National Family Violence Survey provides baseline prevalence data in the realm of family violence, but a similar instrument for community violence is not available (1993). A definition of community violence that encompasses

the entire realm of community violence should include the sum of all the components of community violence. The definition needs to cover the broad range of actions included in community violence. *The definition of community violence used in this paper is the sum of all human actions in a community that harm, potentially harm, or threaten the physical well being of any person in the community.*

Operational modifications of the definition, based on cultural perspective, are possible. For example, a cultural perspective of community violence might exclude arson-related injuries and vehicular homicide as indicators of community violence. The definition used in this paper is very broad so as not to exclude any components of community violence. Components of community violence include but are not limited to:

- violent crimes reported by the UCR, NCVS, and CDC;
- objective counts of gunfire;
- acts of intimidation with guns without use of gunfire;
- use of other weapons such as knives, rocks, and fists to harm or intimidate;

- verbal intimidation that threatens the physical well being of a person;
- chemical warfare;
- biological warfare;
- pollution used to intentionally harm or threaten;
- verbal reports of human actions that harm, potentially harm, or threaten the physical well being of a person.

Two problems with the definition are (a) it does not consider whether the acts of violence are intentional, and (b) it includes actions that are not traditionally considered components of community violence. A related problem with the definition of community violence is that accepted operational definitions and measures for many of the components of community violence do not exist.

As used by Popkin, a public housing development is considered to be a community (1999). Given the massive scope of community violence, this paper will give particular emphasis to one aspect of community violence: gunfire in a community.

Measures of Community Violence

Basic to the research on the impact of community violence in various public housing neighborhoods is an accurate measure of the changing levels of community violence. As mentioned above, the most frequently quoted national measures of community violence are the criminal activities reported to the Federal Bureau of Investigation (Osofsky, 1997; Richters and Martinez, 1993; Garbarino and Kostelny, 1997; and Jenkins and Bell, 1997). The measure used by the Center for Disease Control and healthcare organizations involves the injuries and deaths reported to medical personnel (CDC, 1998). The exposure to violence measure used by the National Institute of Mental Health includes self reports by parents and children of their personal exposure to community violence. Methodological concerns exist in that sizable discrepancies exist between parents' and children's reports of community violence (Martinez and Richters, 1993).

This review analyzes different community violence measurement procedures used in public housing and, when available, gunfire frequency measures. (See Figure 1.1). Particular attention is given to the following questions

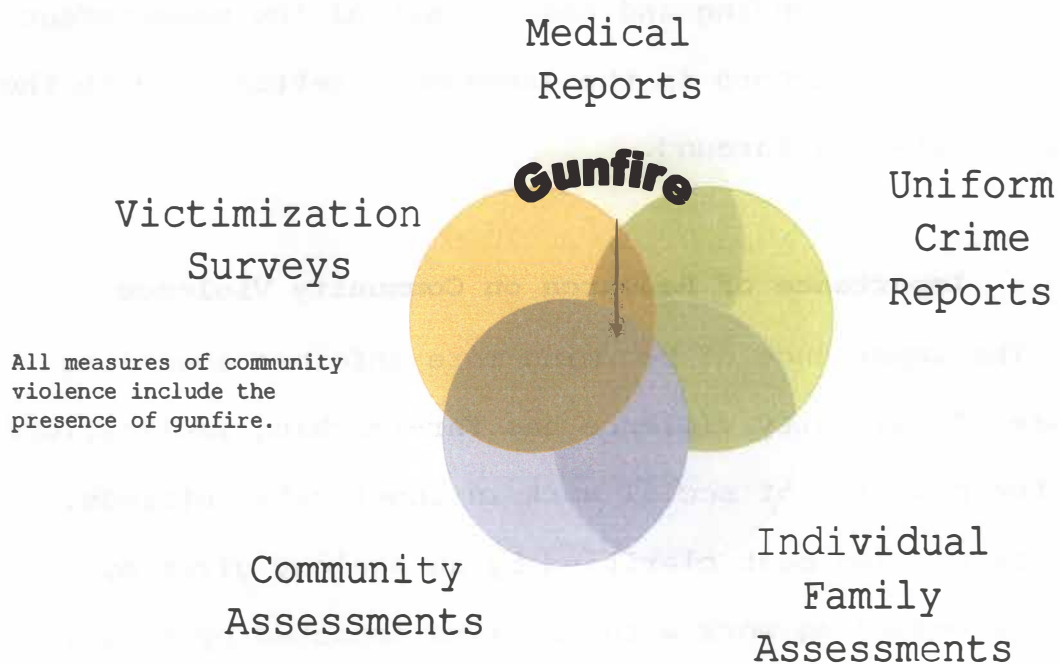


Figure 1.1 Measures of Community Violence

asked by Messick (1993) and Loevinger (1957) regarding the construct validity of measures: how well does the test measure the construct being measured; how well does the procedure measure something that actually exists; and to what extent do the interpretations of the measure correspond to what is measured? As suggested by Messick (1993), importance is given not just to the responses, but also to the persons responding and the context of the measurement. This includes factors in the assessment setting and in the environmental background.

Importance of Research on Community Violence

The importance of becoming more informed about the nature of community violence has far-reaching implications for the practice of social work in inner city settings. This is perhaps best clarified by an analogy given by Rothery regarding work with families impacted by family violence. He states that for years the effects of family violence were not addressed when providing family therapy, marital counseling or other family services. Most clinical wisdom as late as the 1970s dictated that harmful forms of domestic violence were in reality quite rare (1993). As a

result, domestic violence undoubtedly continued when something could have been done to stop some of the assaults.

Currently, many programs are attempting to address the needs of people living in public housing developments. A concern is that the needs of a program to provide a certain type of service may or may not be meeting the needs of the clients served. As indicated by Kissel, changing social conditions requires modifications in the way needs are addressed (1975). In order to address the problems of inner city violence, service providers need to be informed regarding what is actually happening in the day-to-day life of the community. Rothery contends that because social workers desire to help, they must have data that informs their practice regarding what are in reality the most helpful methods for dealing with a client's problem. To not gather data that indicates the most effective method for dealing with a person's problem is considered irresponsible, inhumane and unethical. For example, a very caring and responsive parent may only be offered parenting classes because this is what an organization has to offer. Her major concern is the real, physical danger now facing the client and her children. Conversely, social workers might

focus their attention and resources on dealing with the effects of community violence when the public housing neighborhood where they work actually has a very low level of community violence. Quantitative data that informs the social worker of the nature of community violence is important for their clients as well as for their own safety. Tolan et al state that more studies are needed that identify which characteristics and indicators of a violent community are most influential in impacting child and adolescent development (2003).

Focus of Literature Review

As mentioned previously, this review gives particular attention to exploring what we know about community violence and gunfire levels experienced by children living in housing developments. To more fully understand what we know about community violence in housing developments, it is necessary to look at data from larger communities. Often data from housing developments are aggregated with data from larger areas. Also, the validity and reliability of measures of community violence are reviewed below.

Issues related to economic status, gender and race are also addressed.

CHAPTER II

Measures of Community Violence

To explore what we know about community violence and gunfire in housing developments, this chapter reviews (1) the major measurement instruments of community violence and (2) research using the measurements. The measures of three organizations are reviewed: U.S. Department of Justice, U.S. Department of Housing and Urban Development, and Centers for Disease Control and Prevention. These instruments primarily measure violent crimes, which are one component of community violence.

U.S. Department of Justice Measures

The United States Department of Justice has two crime measures that are frequently used to describe community violence. These two statistical indices attempt to measure the nature, magnitude, and impact of crime in the nation. In both indices the behaviors measured include murder and non-negligent manslaughter, aggravated assaults and other assaults. The Uniform Crime Report (UCR) and the National Crime Victimization Survey (NCVS) use different methods and focus on different aspects of crime (U.S. Department of

Justice, 1995). The methodology and focus of each measure are reviewed below. Findings related to community violence and gunfire are included. Because information from public housing developments is aggregated with larger communities, specific information regarding public housing is usually unavailable. Concerns regarding the construct validity and reliability of measures for public housing are also addressed.

Federal Bureau of Investigation Uniform

Crime Report (UCR)

Description of UCR

The U.S. Federal Bureau of Investigation Uniform Crime Reporting Program is a massive data collection program collecting information from over 16,000 city, county, and state law enforcement agencies. The main objective of the program is to generate a reliable set of statistics for use in law enforcement management, operation, and administration. Over the years, "the data have become one of the country's leading social indicators" (p.1). A review of articles addressing community violence shows that authors frequently list descriptive statistics from the Uniform

Crime Reports. The authors of the 1996 UCR state that the American public looks to Uniform Crime Reports for information on fluctuations in the level of crime. Criminologists, sociologists, legislators, municipal planners, the media and other students of criminal justice use the statistics for varied research and planning purposes (p.1).

The Uniform Crime Report began in 1929 to collect information reported to law enforcement agencies on crime. The offenses they categorize as Part I offenses are aggravated assault, homicide, forcible rape, robbery, burglary, larceny-theft, motor vehicle theft, and arson. In addition to Part I offenses, the UCR solicits information on all crimes except traffic violations. Offenses called Part II crimes include all offenses not listed as Part I crimes. The UCR data are compiled (1) through state-level UCR programs in 44 states and the District of Columbia and (2) from local law enforcement agencies. Law enforcement agencies report crime data to the U.S. Department of Justice Federal Bureau of Investigation. The age, sex, and race of arrestees are reported by crime category. When state agencies do not comply with the UCR reporting requirements,

the UCR program may reinstitute direct reporting from law enforcement agencies within the state (U.S. Department of Justice, 1997).

Sources of Error

Following are some of the sources of error that impact the reliability and validity of the Uniform Crime Report data. Many of the sources of error apply only to populations experiencing environmental factors such as poverty and intimidation. Conditions for the likelihood of systematic and random errors are described.

Inconsistent Data Management System.

Collection of basic UCR data is an enormous task. Information is collected from over 16,000 law enforcement agencies. The front line for collecting information is the police officer. The recording of data is only a very small portion of their daily duties. With such a massive number of people with different training levels recording data, interrater reliability is possibly a concern. The consistency of the observations across raters may be of interest.

Instruments for recording data also vary among agencies. Enforcement agencies sometimes compile more detailed information than is required, but this is frequently not feasible. Although the cost of computers and software has decreased, many agencies still have limited data management capabilities. According to the National Institute of Justice National Assessment Program: 1994 Survey Results, 2,500 directors of criminal justice agencies indicate that information systems are their highest concern. Some agencies still rely on paper and pen.

Of greatest interest to sheriffs and police chiefs are systems to support problem solving and disposition of cases. Many believe the current systems lack the ability to analyze repeat call analyses or to track progress on problems and projects. Most police chiefs and sheriffs report that they have court information systems (66.9 percent), but 79.5 percent indicate that the system needs improvement. One judge commented that part of the problem is that there has been a deluge of computer programs, but many people are slow to change. Some respondents are not knowledgeable about the capabilities of the computer systems they currently have (National Institute of Justice, 1995). The concerns

expressed by the sheriffs and police chiefs for information system needs seem to indicate that many want a better way for processing and reviewing the data generated by their departments. They want more information about what is going on in their jurisdictions. Some respondents even want more current information on social resources in their areas. The UCR Program does receive data from 16,000 law enforcement agencies; however, the reporting process varies from very sophisticated data management systems to agencies struggling to compile the most basic data. A uniform data management system within the 16,000 reporting law enforcement agencies does not exist. Limited data management capabilities limit what is known about violent crime occurring specifically in public housing.

Missing Data.

As stated by the 1996 Uniform Crime Report (1997), law enforcement agencies report data representing ninety-five percent of the United States total population. The UCR authors list several reasons for not including approximately five percent of the population. For example, Montana's estimates for 1995 were not available until after the

publication of Crime in the United States 1995. To be included in the jurisdictional statistics figures for all 12 months of a year, law enforcement agencies must submit reports before the UCR publication deadlines. Although most agencies do submit data to the UCR Program, sometimes the data does not cover complete annual periods. Another problem is that the Federal Bureau of Investigation deems some reports invalid. For example, the aggravated assault figures reported in Kentucky for 1994 were not valid. Data is considered invalid when it is found that annexations or crime reporting procedures are influencing the reported level of crime. For purposes of looking at UCR information pertaining to housing developments, there is no indication that the missing data from the five- percent of the population not included by UCR is over-represented by residents of public housing developments.

Underestimated Offense Rates.

The information from the UCR includes four offenses in its operational definition of violent crime: murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault. Law enforcement agencies report the

numbers of "actual offenses known" to the UCR Program regardless of whether anyone is prosecuted or arrested. Agency counts do not include complaints determined to be false or unfounded (U.S. Department of Justice, 1997).

One concern is how well the current system is working for reporting crimes that occur in housing developments. Research is not available on how complaints in public housing are determined to be false or unfounded. Judd, Smith, and Kidder state that the reliability of measures depends on the extent to which independent observers concur in their ratings of the same objects or events (1991). The reliability of what is reported to the UCR is a concern when the same event is reported in one community as a violent offense but is not reported as a violent offense in another community.

Certain assumptions appear to be in existence for the reporting system to work with a high degree of reliability. A witness or victim needs to assist the officer by reporting the crime. Klockars, professor of criminal justice at the University of Delaware, further clarifies factors that influence what law enforcement agencies report to the Uniform Crime Report Program. He states that police reports

are subject to many types of discretion. Citizen discretion impacts what they report. Police cannot report crimes that are not reported to them. Also, some offenders successfully conceal crimes that occur. Furthermore, police have discretion in what they report. Finally, and perhaps most importantly for high crime areas, for crimes that are ongoing such as drug dealing, crime report numbers reflect more the resources allocated to address the crime than a change in the crime rate (1997). The reliability of UCR data appears to be very high in the majority of neighborhoods; however, the accuracy of violent crime data representing people living in some public housing is more of a concern. Underreporting of violent crime in public housing gives an inaccurate picture of the violent crime rate. Differential reliability is a concern when the level of crime impacts what is reported to the Federal Bureau of Investigation.

Some possible factors impacting the construct validity of UCR data include the discretion of people involved in reporting the crime, the impact of officers' fear in selecting patrol areas that are less potentially harmful to them, the level of resources allocated for solving ongoing

crime such as street drug dealing, and the influence of residents' income and political strength in proportional allocation of resources to match a particular level of community crime. The certain component of discretion exercised by citizens and police officers in high crime communities is that their decisions are complex. Discretion of citizens, police, and law enforcement administration are complicated factors that are not well researched.

The reliability of what is measured by the UCR Program in public housing developments is also influenced by the discretion of those reporting. Pedhazur and Schmelkin (1991) state that reliability refers to the degree to which test scores are free from errors of measurement, with unsystematic errors varying in unpredictable ways. The unpredictable way in which discretion influences what crimes are reported is more of a concern in high crime areas than in low crime areas. The systematic and random errors of the crime data in high-risk areas appear to be higher than the errors of data from safer neighborhoods. Differential reliability is a problem when crimes that would be recorded in safer neighborhoods are not recorded in high crime areas.

Community Policing Goals.

The trend of community policing strategies has the potential of altering the accuracy of what UCR measures. This very positive attempt to develop law enforcement behaviors that assist communities in safety has a different emphasis from the traditional approach of charging people with an offense. The emphasis is on problem solving. What effect this has on the UCR accurately measuring violent activity in communities is still unclear.

The "National Assessment 1994 Survey Results" indicate that the number one research concern of police chiefs and sheriffs is to understand what components of community policing work. A clear ingredient of the assessment is that no one really knows which community policing strategies reduce community violence (National Institute of Justice, 1997). Community policing measurements of safety perhaps need more specific indicators of community safety than are provided in UCR measures. Since the emphasis in community policing is on problem solving, recording all "actual known offenses" may be less of a concern than finding resolutions to some problems. Charging people with a crime may be of less importance than finding a resolution. This is

important work, but measurement of crimes may not follow the traditional reporting procedures. Community policing in public housing developments impacts the reliability of what is reported to UCR. Community policing appears to be a very positive direction for reducing crime; however, the priorities of the program may result in lower numbers of crimes being reported than actually are occurring. This presents a systematic reliability error for the UCR data. The influence of community policing creates almost drifting definitions of offenses with identifying offenses secondary to problem solving. As stated by Crocker and Algina, interrater reliability is a concern when observations are rated differently by different raters (1986).

The UCR provides a wealth of information, but clarifying which population groups it most accurately represents is complicated. How well the UCR system measures violence in regions with high levels of crime and poverty is not well understood. According to the National Institute of Justice report on witness intimidation, one factor that impacts the measure of crime is the presence of a gun in an offense. This report indicates that cooperation with law enforcement personnel is often problematic when guns are

involved in offenses (1994). According to Joseph Shuldiner, "experience has shown public housing residents are reluctant to serve as witnesses because of fear of reprisals and the inability to relocate away from threats" (p. 34, 1994). When conditions are present that interfere with the standard process of reporting crimes, the reliability of the measure is reduced.

The UCR measurement of violence has been further compromised by the findings of the National Crime Victimization Survey 1994 which notes the discrepancy between crime reported in the survey and the FBI Uniform Crime Report. The NCVS data indicates that 58% of the violent crimes reported in its survey were not reported to the police. For simple assault, 64% of the crimes were not reported; for aggravated assault, 48% were not reported to police. One assumes that the data from the UCR and the NCVS would be more similar. The data suggest a problem with a low degree of convergent validity. Numerous factors influence which violent crimes are reported to law enforcement agencies for measurement in the UCR. The validity of UCR data is reduced when the data do not tell us accurately the levels of crime actually occurring. The

program does provide very important information, but it is not a precise measure of violent crime in public housing.

Differential Reliability of Clearance Rates.

The UCR Program considers an offense cleared or solved when at least one person is arrested, charged with the offense, and turned over to the court for prosecution (U.S. Department of Justice, 1997). The offense is removed from the UCR count if the charge is considered unfounded. As stated by Travis, the impact of low clearance rates is to lower people's willingness to report crime (1996). This impacts the validity of UCR data. Below are some of the clearance rate findings from the UCR 1996 report. Unfortunately, specific information regarding crimes in housing developments are not routinely recorded. Therefore, crimes in housing developments are included within the data for larger categories. This following review gives particular attention to aggravated assault, assault, and murder.

Influence of Population Group.

One category for reporting crimes involves the grouping of locations by population groups. (See Table 1). Statisticians group locations by the size of cities, and by whether the areas are rural or suburban. A metropolitan statistical area (MSA) is defined as an area that includes a central city of at least 50,000. Rural is defined as being outside of a metropolitan statistical area, not under the jurisdiction of a city police department, and mostly unincorporated. Counties in a metropolitan statistical area are designated "suburban." A suburban area includes (1) cities with less than 50,000 inhabitants and a police department and (2) unincorporated areas within a MSA. In 1996, the violent crime offenses reported by all law enforcement agencies were 1,293,408 with 47.4 percent cleared by arrest. This means that for 613,075 violent offenses, someone was turned over to the court for prosecution, and for 680,332 violent offenses no one was charged with the offense. Rural county law enforcement agencies reported the highest percentage of violent crimes cleared by arrest, 62.3 percent. Clearance rates for violent crimes decreased from 62.3 percent to 39.3 percent

Table 1. UCR Offenses Known and Percent Cleared by Arrest and Population Group, 1996

Population Group	Violent crime	Murder and non-negligent manslaughter	Aggravated assault
Rural Counties			
Offenses known	51,466	1,042	41,286
Percent cleared	62.3	79.3	65.0
129 Cities, 50,000 to 294,999			
Offenses known	155,554	1,846	90,780
Percent cleared	47.9	73.3	58.3
Population Group	Violent crime	Murder and non-negligent manslaughter	Aggravated assault
15 Cities, 500,000 to 999,999			
Offenses known	126,364	1,765	64,005
Percent cleared	39.3	54.7	52.1
9 Cities, 1,000,000 and over			
Offenses known	272,260	3,397	136,687
Percent cleared	41.3	63.1	54.6

Table 1. continued

Population Group	Violent crime	Murder and non-negligent manslaughter	Aggravated assault
Total 11,008 agencies			
Offenses known	1,293,408	15,487	775,204
Percent cleared	47.4	66.9	58.0

as population size increased to 999,999 citizens. The authors of the report state that the clearance rate is much higher for some crimes against persons because law enforcement agencies devote more intensive investigative effort to those types of offenses.

The data suggest that one is more apt to be a victim of violent crime in a city with a population over 1,000,000 and that the likelihood of clearing the offense is lower, only 41.3 percent. The data indicate that violent crime is least likely to be cleared in a city with a population between 500,000 and 999,999 with a 39.3 percent clearance rate. Having cases solved does appear to be more of a problem in mid to large cities than in small cities or rural areas. The impact of a low clearance rate is to lower people's willingness to report crime (Travis, 1996). The reduction

in numbers of people reporting crimes results in decreasing the statistical conclusion validity of the measure. Again, this is more of a problem in areas with low clearance rates.

Influence of Geographic Region.

Law enforcement agencies from different geographic regions differ by crimes reported and rates cleared (See Table 2). As indicated by Tonnies, deep social and historical differences exist in the way systems of different regions interrelate (1955). The South reports the highest rate of murder and non-negligent manslaughter, with a 68.5 percent clearance, and the Northeast reports the lowest rate, with a 70.7 percent clearance. Information regarding repeat victimizations is not given. The UCR data indicate that one is somewhat more likely to be a victim of violent crime in the South or the West and less likely to be a victim in the Northwest or Northeast.

Influence of a Gun.

A further review of aggravated assault data indicates a much higher rate of clearance by arrest for offenses involving fists or knives than offenses involving guns.

Table 2. UCR Offenses Known and Percent Cleared by Geographic Region, 1996

Geographic region	Violent crime	Murder and non-negligent manslaughter	Aggravated assault
West			
Offenses known	388,725	4,320	240,237
Percent cleared	47.2	60.7	58.4
Rate per 1,000	7.15	.079	4.42
South			
Offenses known	450,378	6,343	283,839
Percent cleared	49.2	68.5	58.2
Rate per 1,000	6.8	.096	4.3
Midwest			
Offenses known	178,775	2,158	106,498
Percent cleared	45.6	69.4	55.0
Rate per 1,000	4.7	.057	2.8
Northeast			
Offenses known	275,530	2,666	144,630
Percent cleared	46.0	70.7	59.0
Rate per 1,000	5.7	.055	3.0

(See Table 3). For the total population, the clearance rate for assaults involving hands, fists, feet, etc., is 65.2 percent; however, the clearance rate for assaults involving guns is 41.9%. Again, clearance rates vary from different geographic regions. In rural areas the clearance rate for aggravated assaults using fists, feet, etc. (66.4 percent) is closer to the clearance rate for aggravated assaults involving guns (64.1 percent). Cities with populations of 1,000,000 and over report a much greater difference in clearance rates. Those cities report a clearance rate of 64.7 percent for offenses involving fists, feet, etc., and a clearance rate of 34.6 percent for aggravated assaults involving guns.

The data indicate that the system is working more effectively in solving aggravated assault offenses in rural areas than in large cities. Cities with populations between 100,000 and 249,999 also report large differences in clearance rates. The clearance rate for aggravated assaults using fists, feet, etc., is 65.7 percent. The clearance rate for aggravated assaults using guns is 30.6 percent. The UCR data indicate that aggravated assaults in cities are much less likely solved if guns are involved in the offense.

Table 3. UCR Aggravated Assaults Known and Presence of Weapon

Population group	Firearm	Knife or cutting instrument	Other Weapon	Hands fists, feet, etc.
Rural Counties				
Aggravated Assaults	7,844	5,719	10,779	16,944
Percent cleared	64.1	68.9	61.3	66.4
129 Cities, 50,000 to 249,999				
Aggravated Assaults	26,167	16,515	33,370	20,636
Percent cleared	34.6	64.5	59.1	65.7
15 Cities, 500,000 to 999,999				
Aggravated Assaults	16,254	12,286	25,205	10,260
Percent cleared	47.3	62.2	51.2	50.1
9 Cities, 1,000,000 and over				
Aggravated Assaults	40,164	27,162	39,759	29,602
Percent cleared	30.1	65.0	64.6	64.7

Table 3. continued

Population group	Firearm	Knife or cutting instrument	Other weapon	Hands fists, feet, etc.
Total				
Aggravated Assaults	174,593	134,546	251,263	219,377
Percent cleared	41.9	64.7	58.1	65.2

In regard to Messick's question regarding factors in the assessment setting that impact the construct validity, a low clearance rate is a factor. People are less likely to report a crime when the clearance rate is low. Low clearance rates and the impact of intimidation in public housing are explored in the next section.

Influence of Public Housing.

Information provided by the National Institute of Justice report on "Preventing Gang and Drug-Related Witness Intimidation" indicates that the clearance rate in public housing is lower than that for the rest of a city (1996). Jeremy Travis, the Director of the National Institute of Justice, states that many prosecutors and police officers

express frustration with their inability to investigate and prosecute many cases successfully. Key witnesses refuse to provide critical evidence or to testify because of fear of retaliation by defendants or their friends and family. This adversely affects the justice system's functioning and simultaneously erodes public confidence in the government's ability to protect people (1996). This also lowers the construct validity of the UCR. The Messick question regarding how well the test measures the construct being measured is important in this regard. The number of crimes reported is not valid due to some witnesses' refusal to provide critical information. The actual number of violent crimes is higher than what is actually reported. No one knows how much higher the crime rates would be if victims and witnesses provided all the needed information for crimes to be counted in the UCR. Witnesses' refusal to provide critical information becomes a source of systematic error for the UCR.

As indicated by Jeremy Travis, the "fear of retaliation" factor influences the reporting of crime far more in housing developments than in suburban or rural areas (1996). The validity of UCR data from public housing

developments is much more influenced by fear of retaliation than data from suburban and rural areas. The crime rates listed in public housing developments are frequently moderate to high, but in reality the crime rates are often higher than what is recorded. This is very important for realistically addressing the level of community crime and its impact on children's growth and development.

The National Institute of Justice lists the following factors in witness intimidation:

- violence is a part of the initial crime;
- the witness has a personal connection to the accused;
- the witness lives near the defendant;
- the witness is vulnerable (e.g., the victim is elderly).

The report continues that people living in gang-dominated neighborhoods frequently fall into more than one category, which increases their likelihood of exposure to intimidation (1996). The factor of vulnerability appears to have an impact on some people who live in public housing communities that are dominated by gangs. Vulnerability is a factor for children, the poor, and the uneducated when dealing with

violent offenders. High poverty and high concentration of children are frequently characteristics of public housing developments. Goering et al. compared the income of public housing households with other households within the same census tract. The average income for homes in public housing was approximately \$7,400, and the average income of other homes in the census tract was \$21,000 (1994). Also, 44% of public housing households include children, and the elderly comprise 35% of the households (Holzman, 1996). Research regarding factors that influence the relationship between being a child or parent in a high crime neighborhood and interfacing with law enforcement agencies would be important for improving the reliability of crime reporting.

Much of the information expressing concern about victim intimidation is from a National Institute of Justice study involving 2,500 directors of criminal justice agencies (1995). No one knows the extent of witness intimidation because of very limited research conducted in this area (National Institute of Justice, 1996). A 1994 survey of 192 prosecutors indicated that intimidation of witnesses and victims was a major problem for 51 percent of the prosecutors in counties with populations greater than

25,000. Thirty percent considered intimidation to be a moderately serious problem. In counties with a population between 50,000 and 250,000, 43 percent listed intimidation as a major problem and 25 percent listed it as a moderately serious problem (Webster, 1995). The Uniform Crime Report cannot function as a valid measure of violent crimes when victim and/or witness intimidation results in crime not being reported. Again, the validity of the report is decreased in that the numbers of crimes reported is reduced due to intimidation. This appears to primarily be a measurement problem in some areas with concentrated poverty such as public housing developments.

The increase in victim intimidation is not fully understood. Possible explanations listed in the National Institute of Justice report on intimidation include the following:

- defendants are younger than in the past;
- they appear to have a profound lack of respect for people in authority;
- they often feel powerless and socially inadequate;
- firearms are readily available;

- increased penalties imposed on people convicted of violent crime increases the stakes of a prosecution (Ramsey, 1996).

A major component of witness security programs is the management of the witness. Law enforcement personnel are cautioned not to guarantee security to witnesses because of liability concerns. Safety is a problem. The witness or victim is sometimes relocated. The presence of fear among witnesses or victims does raise questions involving the risks involved in reporting crime in high risk neighborhoods. Sometimes victims must decide if reporting a violent crime is worth living in increased fear and/or relocating to a different neighborhood. For most people living in the United States, the traditional system of reporting a violent crime increases one's sense of safety. The crime reporting system appears to work much less effectively for citizens living in some high crime areas. Some areas for further research in public housing developments include:

- the impact of intimidation on traditional crime reporting;

- crime reporting and recording techniques that reduce or eliminate intimidation;
- officer motivation in high crime neighborhoods;
- specialized officer support and incentives for officers working in dangerous neighborhoods;
- community policing techniques that reduce fear in witnesses and victims;
- alternative police and mental health techniques that increase neighborhood safety in high crime areas.

Trends in Violent Crime

Influence of Age.

In exploring what we know about community violence, the UCR data suggests certain trends. Again, information regarding housing developments is usually aggregated with larger communities. Trends indicated by population group size, age, race and gender are critiqued below. Violent crime rates are compared for the years between 1987 and 1996.

The UCR data indicate that age is an important factor in crime rates. The data for years between 1987 and 1996 indicate substantial increases in murder and non-negligent

manslaughter among persons less than 18 years of age. (See Table 4). The number of persons under the age of 18 arrested for murder or non-negligent manslaughter increased by 50.5 percent from 1,355 to 2,036. Following a similar trend, the arrest rate for aggravated assault for the total population increased by 43.1 percent, but the arrest rate for people under the age of 18 increased by 70.2 percent. It is important to also clarify, however, that persons over 18 years of age commit the majority of crimes. In 1996,

Table 4. UCR Total Arrest Trends for Age, 1987-1996

Offenses	Under 18 Years of Age			18 Years of Age and Over		
	1987	1996	Percent Change	1987	1996	Percent Change
Murder and Non-negligent Manslaughter	1,355	2,039	+50.5	12,611	11,407	-9.5
Aggravated Assaults	29,705	50,560	+70.2	211,793	295,084	+39.3
Other Assaults	77,415	154,762	+99.9	459,112	718,268	+56.4

for example, 15 percent of the people arrested for murders and non-negligent manslaughters were under the age of 18 with 85 percent over 18 years of age. In summary, the 1995-1996 UCR data indicate arrest rates for people under 18 increased more than for people over 18, but the majority of violent crimes are committed by people over 18 years of age.

The 1995-1996 UCR data also indicates that age is an important factor in crime rates. (See Table 5). For murder and non-negligent manslaughter, people less than 25 years of age account for 56.2 percent of all arrests. For aggravated assaults, 40.0 percent of arrests are of people under 25 years of age, and for other assaults 40.3 percent of arrests are of people under 25 years of age. For all crimes the arrest rate declined by 4.1 percent in the 40-44 year age group, and further declined 3.2 percent in the 45-49 age group. As mentioned previously, the UCR is a listing of the crimes reported to the Federal Bureau of Investigation. Fortunately, families and child-oriented institutions have the major responsibility for dealing with violent acts of young children. The data for children under 10 years of age are therefore not a valid indication of violent acts

Table 5. UCR Violent Crime Arrests, Distribution by Age, 1996

Age	Percent Distribution
Under 10	.2
10-14	5.3
15-19	22.7
20-24	17.7
25-29	14.8
30-34	13.7
35-39	11.0
40-44	6.7
45-49	3.7
50-54	1.8
55-59	.9
60-64	.5
65 and over	.7

committed by young children. This only indicates that appropriate sources of data for young children are the more traditional institutions that nurture, educate, and guide children.

Influence of Gender.

Another violent crime factor strongly indicated by the 1996 UCR data is gender. For violent crimes, 84.9 percent of the people arrested in 1996 were male and 15.1 percent were female. For aggravated assaults, 17.9 of the people arrested were female and 82.1 were male. Although males are arrested more frequently, the arrest rate for females is increasing at a faster rate than for males. The 1987-1996 UCR data indicate that the female arrest rate for violent crime increased 118.1 percent, whereas the male arrest rate increased 52.7 percent. For the 1995-1996 data, the female arrest rate for violent crime increased .3 percent and the male rate decreased 6.9 percent.

The UCR data from 1995 - 1996 indicated an overall decline in violent crimes. For murder and non-negligent manslaughter, the number of people arrested declined 10.5 percent to 13,937. The rate for persons under 18 declined

14.4 percent to 2,109. For aggravated assault, the total rate of arrests declined by 2.8 percent to 368,802. The rate for persons under 18 declined by 4.0 percent to 53,877 aggravated assaults. For the total population the rates of other assaults increased by .4 percent to 907,422. The assault rate for persons under 18 increased 3 percent to 159,836. Caution is needed when interpreting the 1996 trends indicated in UCR data. As indicated by the National Institute of Justice in their "Annual Report to Congress 1996," the decline in crime from 1995 to 1996 was positive news, but the downturn from a record high was unevenly distributed across American communities. While violent crime rates have declined for most age groups, teens continue to have the highest rate of victimizations including homicide (1997).

Influence of Race.

The UCR data regarding race is perhaps the most complex in terms of factors that influence crime rates. The UCR indicates that the murder and nonnegligent manslaughter arrest rate for black people is 54.9 percent of the total rate. For aggravated assault, whites comprise 59.6 percent

and black people account for 38.1 percent of people arrested. For other assaults, 62.4 percent of the people arrested are white and 38.1 percent of the people are black. Elliot (1994) states that for continuing in a violent lifestyle, "where one is living may be as important as whether one is working or living with a partner," (p. 17). Factors in the environment included employment possibilities, discrimination, poverty, supportive family, and the presence of an illicit economy. In the material presented in the National Crime Victimization Survey 1994, people who are young, black and male are considered the most vulnerable to violent crimes. This survey indicated that the chances of being a victim of a violent crime were 1 in 9 for black males between the ages of 12 and 15 years of age compared to 1 in 196 for people over 65. The likelihood of victimization increased if a person lived in a household with an income of less than \$15,000.

The implications of the data lead to a variety of research questions regarding how the traditional security system can better fit the needs of people living in poor, black, urban communities. Community policing, in some situations, is attempting to increase trust and belief that

the law enforcement system is capable of addressing the safety needs of people living in public housing developments. Research does not yet have any clear answers on how to address the very important issue of goodness of fit between the public housing's safety needs and the law enforcement system.

Michael Tonry, School of Law, University of Minnesota, speaking at a National Institute of Justice Research in Progress Seminar, stated that "in every country, crime and incarceration rates for some minority groups greatly exceed those for the majority. Perhaps most importantly, there are comparable disparities both for racial and ethnic minorities and for some that are not 'visible' minorities" (p. 1, 1997). He further states that stereotyping and cultural behaviors of minority groups often work to their disadvantage. Often offenders of a subculture share similar patterns of dress, speech, socioeconomic backgrounds, and places of residence and recreation. In the United States, young black men are victimized when people assume that individuals with similar characteristics are likely to be offenders (1997).

Influence of Childhood.

Although the UCR is a vast resource of data for crimes involving adults, it provides very little information regarding assaults among children. Law enforcement agencies traditionally leave the handling of violent behavior among young children to their families and the social agencies that care for them. The UCR data do not include information regarding how often children under 12 are victimized by the violent acts of other children. Children who are victims of violent acts live in a three-tier system where discretion is exercised regarding whether to tell an adult, whether the adult will report the offense, and whether law enforcement personnel will consider responding to the offense congruent with their job responsibilities. The UCR does not attempt to measure the violent victimizations of children going to and from school, playing outside, etc., unless the offense is reported to an adult who reports the offense to the police, who in turn files a petition. The violent behavior of young children is generally considered to be the responsibility of their families or social organizations. For example, children under 10 account for

.2 percent of all people arrested for violent crime. This is not a negative regarding law enforcement agencies or the UCR, but a clarification of boundaries.

The lack of law enforcement agencies' involvement with children indicates the need for families and social agencies to assume more responsibility for children's behaviors that reduce community safety. Most law enforcement agencies are not equipped to deal constructively with the needs of young children. According to Fielding, the trends toward law enforcement agencies stiffening penalties and trying children as adults fail to reduce juvenile crime (1997). Champion states that waivers to try children as adults function more as a cosmetic response to public concern than as a viable solution to reducing violence (1989). Law enforcement agencies lack resources and alternative interventions for children. This perhaps clarifies the need for children's organizations to also address community violence.

UCR Summary

In review, the UCR provides a wealth of information regarding violent crime, but practitioners and researchers must not assume the reports provide more information than is indicated. Some factors addressed above that limit the validity and reliability of the UCR data in public housing developments include:

- discretion in reporting crime;
- fear of repercussions if a crime is reported;
- presence of a firearm in the offense;
- goodness of fit between the person experiencing the crime and traditional law enforcement strategies;
- age of victim's offender

Again, as stated by Richters and Martinez, crime rates represent only "a crude index of the day-to-day community violence that characterizes many neighborhoods throughout American cities" (p. 7, 1993). For people living in public housing developments, the UCR gives us information regarding what is reported to the Federal Bureau of Investigation. This is important information, but it provides only a partial view of the behaviors that comprise community violence in public housing developments. Also,

the crime data from urban public housing tends to be combined with other inner city areas.

National Crime Victimization Survey (NCVS)

Description of NCVS

In the review of UCR data above, frequent comparisons and contrasts with the National Crime Victimization Survey data have been made. The National Crime Victimization Survey (NCVS) was instituted in 1972 as a complement to the Uniform Crime Report. The survey provides data on victims, crime incidents, and trends from the victims' perspective. One concern frequently mentioned in reports by the National Institute of Justice is that crimes are frequently not reported to law enforcement agencies. Approximately 54.3% crimes of violence reported in the NCVS are not reported to police. The NCVS provides another measure of crimes in the United States by collecting victimization information from a sample of approximately 80,000 people from about 43,000 households. It is the second largest ongoing household survey in the country (NCVS, 2001).

The process for administering the NCVS begins with the U.S. Bureau of the Census randomly selecting a sample from a rotating panel of all households. All age-eligible individuals in the selected households become part of a panel. Every six months respondents are interviewed for three consecutive years. An exception is made to use proxy interviewing instead of direct interviewing for the following cases: incapacitated persons, individuals absent from the household during the entire field-interviewing period, and 12-and 13-year-old persons when a knowledgeable household member insists they not be interviewed directly. For people who have telephones, the first and fifth interviews are in-person interviews and the rest are by telephone. For people without telephones, all interviews are face-to-face. Many of the questions can be answered by "yes" and "no" responses in order for people to respond more freely on the telephone when they are in the presence of others (NCJRS, 1994).

Increased Reliability of the NCVS

According to the 1999 NCVS, 62.4% of the crimes reported on the survey are not reported to police. Crime

report rates vary from 14% to 95%. Only 14% of thefts under \$50 are reported, but 95% of car thefts are reported to police. For crimes of violence, 54.3% of the crimes reported on the NCVS were not reported to police. In addition, of the crimes of violence reported to police, 60.4% of the crimes did not result in a police officer taking a police report. Stated differently, 45.7% of the crimes of violence reported in the NCVS were reported to police. Of the 45.7% of violence crimes reported to the police, 39.6% of the crimes resulted in police data recorded in the UCR. The NCVS data indicate that 18.1% of the crimes of violence recorded in their data are included in the UCR data (2001). Two major strengths of the NCVS are (1) recording offenses that are reported to police but not reported to the UCR, and (2) recording 19.8% of the offenses reported to the NCVS but not reported to police because of personal or private reasons (2001).

The NCVS also has a more systematic data collection system. In contrast to the UCR, the NCVS is administered by people whose jobs are to administer the NCVS. Gathering information for the UCR is a small part of the duties of officers from over 16,000 law enforcement agencies. In

addition, NCVS field representatives usually reside in the area in which they interview. The race and ethnicity of the representatives generally match the local population.

Sources of Error

Following are some of the sources of error that impact the reliability and validity of the National Crime Victimization Survey. As with the UCR, sources of error are more apt to occur in populations experiencing poverty and intimidation. Conditions for the likelihood of systematic and random errors are described below.

Underestimated Offense Rates.

A concern listed in the 1999 NCVS is the tendency of victims to not report crimes committed by offenders who are not strangers. Secondly, the NCVS reports that among some groups, crimes which contain elements of assault could be a part of everyday life. They are therefore forgotten or not considered important enough to mention to a survey interviewer. Also, although the intent of the survey is only to gather information, some may consider it safer not

to reveal information. Such recall problems result in an understatement of the actual rate of assault (2001).

The process of establishing trust for a NCVS interview is a complicated factor. According to Popkin et al., respondents in public housing frequently do not acknowledge victimizations. An unwritten rule within some public housing is to "mind your own business" and not talk about victimizations that occur (1999).

Certain assumptions exist for the NCVS to work. People need to report their victimizations. A problem related to differential validity may exist if people in high crime areas do not accurately report to the interviewers. Factors of intimidation may still be in existence. Why repeatedly answer questions from a 13-page survey and a 21 page incident report when trust and intimidation are personal factors? The assumption is that respondents accurately answer survey questions every 6 months for three years. The impact of living in chaotic or high crime areas on NCVS responses is not known. Also, what impact does the presence of a gun in a crime and fear of reprisal have on the accuracy of information reported? A related question is the impact on males of being interviewed by female

representatives. Only about 10% of the NCVS representatives are male, and this perhaps has some impact on the quality of information given by male respondents. Data are not presently available to answer these questions.

In keeping with the focus of this paper on measuring community violence in public housing, the NCVS gives limited information on community violence specifically in public housing. Until recently, a box was not available to record whether or not a person lived in public housing. No information regarding type and design of the public housing is available. HUD has recently developed a victimization survey based on the NCVS that is specifically for people living in public housing. This is discussed in detail in the HUD section of this paper.

Missing Data.

In 1999 the NCVS response rate was 93% for households and 89% for persons within households. A household non-interview adjustment is made for non-responses at the household level by inflating the weight assigned to interviewed households with similar income, race, and ethnicity. A problem exists that homes with similar

incomes, race, and ethnicity may vary dramatically regarding violent victimization. Also, as suggested by Holzman (1994) and Popkin et al. (1999), living in public housing is a major factor in not reporting victimizations.

Similarly, nonresponses within a household are dealt with by inflating the weight assigned to the interviewed persons in the household. Again, Holzman (1996) has indicated that victimization levels are higher with self-reports than when someone speaks for another person.

The implication of not interviewing children under 12 years of age impacts what we know about victimization in children's lives. Richters and Martinez (1993) indicate that children report a higher level of victimization with a self-report than when parents report for them. Also most of the questions in the NCVS only address victimizations for people 12 years and older. The implication of this is that little is known about the actual levels of victimizations experienced by children. The NCVS data does indicate that the very highest rates of victimization are for black males and females in the youngest group for which data is recorded, the 12-15 year age group. The rate for black females is reported as 127.5 per 1,000 persons in this age

group. For black males the rate is 91.8 compared with an 85.6 rate for white males and 50.3 rate for white females. The black female rate is 57.1 in the 20-24 age group. In addition, young people in the 12-19 age group were the least likely to report violent victimizations to police, only 30.2%. The data we have indicate a strong need to be more fully aware of the victimizations of young people under 12 years of age.

Another area of missing data involves counting data from series victimizations. A series victimization is defined as six or more similar but separate crimes which the victim is unable to recall individually or describe in detail to an interviewer. Since 1980, series crimes are counted as a single victimization. The 1979 NCVS report shows that victimization counts and rates were higher in 1979 when the series crimes were added. A separate category for series victimizations is included, but information about series crimes is excluded from the count of individual victimizations. For areas where repeat victimizations are higher, this is important information when trying to understand patterns and hopefully, solutions to problems.

Findings

Regarding community violence in public housing, some NCVS factors that also are relevant to people living in public housing include economic level, age, and location of a violent victimization. The economic level of people living in public housing is usually low due to the guidelines of public housing. NCVS data related to this low economic level indicates that the highest violent victimization level (71 per 1000) is recorded for people with yearly incomes less than \$7,500. The violent victimization rate declines as income increases with a 30.7 rate listed for people with incomes of \$75,999 or more.

Age is another factor in high violent victimization rates. People between the ages of 12 and 15 are three times more likely to be violently victimized than people between 35 and 49 years of age (Rand, 1998). In addition, repeat victims are least apt to notify police and repeat victimizations are highest in areas with the highest crime levels (Travis, 1996).

NCVS data indicates that most violent victimizations occur in public places. For crimes of violence, the NCVS

indicates that only 5% occurred inside a home or lodging. Forty percent occurred within one mile of the victim's home, 26% occurred over one mile but less than five miles from home, 24% occurred between five and fifty miles from home, and 5% occurred 50 or more miles from the victims home.

The implication is that people are most apt to be victims of violent crime if they are very poor, young, and outside their homes. Many of these factors apply to residents of public housing but more precise measures of community violence in public housing are needed.

Centers for Disease Control and Prevention's Recommended Measures (CDC)

Since the early 1980's the Centers for Disease Control and Prevention have supported and promoted a public health approach to violence in the United States. Activities of CDC are based on two fundamental principles: (1) policies, interventions, and programs for preventing violence must be firmly grounded in science; and (2) full participation of communities is necessary for the development of a sense of ownership for the problems of violence. Since 1992, CDC has been funding projects to further develop the knowledge base

of information regarding violence (Mercy, Thornton, & Crawford, 1996).

As stated by Powell et al., individually oriented strategies are more common than strategies directed toward communities. One concern is that CDC funding for individual-level interventions is easier to obtain, resulting in a shortage of community level interventions. A major reason for the limited number of community level studies is that the power of studies to establish statistically significant differences between comparison groups and an intervention is less than the power of comparably sized projects with individual randomization (1996). In keeping with the public health direction, Powell et al. indicate that a future direction for research is to examine variables that lead to positive community changes in violence levels (1996). Satcher et al. further indicate that individually oriented strategies should definitely be continued, but that this work must be complemented by strategies designed to reduce violence exposure at the family, peer, community, and societal levels (1996). This emphasis on research is in keeping with the focus of this

paper regarding the need to address the variables of community violence.

Suggested Measures

The Center of Disease Control has recently published a list of suggested measures for assessing violence-related attitudes, beliefs, and behaviors among youths (1998). Following is a review of measures suggested by the CDC that might be helpful in measuring variables of community violence. Two measures are listed for assessing young people's individual levels of exposure to violence, and four measures are listed as environmental assessments of the quality of neighborhood life. Measures of reliability are given for most measures.

"Children's Exposure to Community Violence"

The "Children's Exposure to Community Violence" measure by Richer & Martinez consists of 12 items. The items include 12 statements and respondents have a choice of four answers: (1) never, (2) once or twice, (3) a few times, and (4) many times. A concern mentioned by Holzman is that the assessments of adults need to be repeated again after six

months. Adults tend to "telescope" violent events and include events that occurred outside of the time frame indicated (1999). The impact of time on what children report is a concern regarding the validity of the information that is reported by children for a particular time frame. The concern that test-retest reliability was not established was a concern listed by Richters and Martinez in a National Institute of Mental Health study conducted in Washington, DC. They indicate, however, that they had confidence in the ability of children to provide useful estimates of violence exposure due to significant levels of pairwise agreement and because of details of exposure volunteered by respondents in face-to-face interviews (Richters & Martinez, 1993). Richters and Martinez list the target group for the assessment as African-American males between the ages of 12 and 16. The internal consistency is listed by CDC as .84. CDC states that exposures to violence through sounds and sights are addressed. The one statement regarding sound is "I have heard guns being shot." Ten statements refer to what the young person has seen and one statement asserts "my house has been broken into," (CDC, 1998).

A concern regarding the measure of violence exposure through sounds is that more specific information is needed. The impact on children of hearing gunshots nightly is perhaps different from the impact of hearing many shots in one isolated event. The measure would not distinguish those neighborhoods that have a very high frequency of gunfire from those having significantly less gunfire. The measure gives some important information regarding violence in the community, but it is not a precise measure of sound or sight experiences that negatively impact the safety of people living in an area.

"Victimization Scale"

The "Victimization Scale" measure for middle school students by Nadel, Spellmann, Alvarez-Canino et al., (1996) is also listed by CDC. One problem is that reliability of the instrument has not been established. The assessment includes 135 items about violent activity at school, outside of school, in the neighborhood, and at home. One point made by CDC is that the field of assessing violent behaviors is new and very few standardized instruments with established population norms are available (CDC, 1998). The

victimization scale appears to be in the earlier stages of its development as a measure of the construct victimization.

Environmental Assessments

All four environmental assessments of quality of neighborhood are normed to urban residents eighteen years of age and older. None of the assessments specifically measures community violence. They do address the important area of neighborhood cohesion. Bolland suggests that lack of neighborhood cohesion is negatively correlated with high levels of community violence (1998).

CHAPTER III

Public Housing History, Problems, and Community Violence Research

The following section will look at (1) the history and current trends in public housing, (2) the research and measurement of community violence and gunfire in public housing, and (3) the problems encountered in HUD's attempts to measure community violence in public housing.

Having reliable, valid information about the safety of community life in public housing is very important in that the growth and development of many children are affected. Secondly, millions of Federal dollars are spent on public housing. This section also clarifies the need for a reliable instrument that measures community violence or at least components of community violence. Material also indicates the need to reliably measure gunfire in public housing.

History of U.S. Public Housing

The public housing program began in 1937 with the passage of the United States Housing Act. The legislation

authorized the formation of public housing authorities with each agency retaining ownership of its public housing property. The federal government does not own public housing authorities. The direction of public housing changed when the 1949 Housing Act provided housing for families needing help with rent. In 1969, the emphasis shifted to federal funds providing rent subsidies for low-income families choosing to live in public housing. This financial shift in public housing resulted in public housing authorities changing from economic self-sufficiency to dependence on federal funds for a substantial amount of housing authorities' budgets (Holzman, 1996). The number of public housing authorities has grown to 3,224. U.S. public housing units are home to 3.3 million people. Thirty-five percent of the residents are elderly, and 44% of the households include children (Bolland & McCallum, 1999).

Problems in Public Housing

Materials from HUD are often very candid regarding problems in public housing and the attempts being made to address these problems. HUD does not presume to have all the answers. An example of this is the evaluation of the

HUD Urban Initiatives Anti-Crime Program. The HUD-sponsored evaluation states that the sites selected for the program were not the areas most in need of the program, and the program was created without adequate information about the nature and extent of crime in public housing. The report further states that the centralized control of the program creates violations of local concerns and intolerable delays. Some of the problems in public housing mentioned in the HUD report on transforming public housing include: (1) it concentrates the very poor; (2) it creates concentrated high-poverty neighborhoods; (3) federal micro management aggravates many problems; and (4) market discipline does not apply to public housing (Pate, 1984). Although involvement of residents in planning is increasing, historically, housing choices for people living in poverty were managed by those in authority. Viewed in a light of a capitalistic economic order, the opinions of people without money were given little value (Weber, 1905).

Public housing staff and the residents do not have control of all of the factors involved in improving the livability of public housing. The direction of moving people out of poor neighborhoods to low cost housing in

middle and upper income neighborhoods is often met with resistance from the targeted neighborhoods (HUD, 1991). In a report by the Advisory Commission on Regulatory Barriers to Affordable Housing, barriers to placing low cost housing in various neighborhoods are addressed. Across the country, deeply ingrained and widespread problems exist when attempts are made to place low income housing in communities. Some of the factors listed that tend to keep low cost housing and its residents out of middle and upper income areas include building and zoning regulations and the attitudes of local builders, realtors, bankers, public-sector officials, and neighborhood residents. The "Not in My Back Yard Syndrome" for location of low income housing is an important factor in concentrating large numbers of poor people together in poor neighborhoods (1991). Also, race is still a factor in placement of public housing. HUD indicates that despite efforts to integrate public housing, white public housing residents tend to live in predominantly white neighborhoods in more affluent areas. The majority of African-American public housing residents continue to live in minority neighborhoods that have a higher degree of concentrated poverty (1995). In the 1998 HUD report on "The State of the

Cities," the authors state that overt discrimination in housing has been driven underground and is much more subtle. Present public sector discrimination is more apt to take the form of rental terms and conditions that exclude minorities (1995).

History of Research in Public Housing

Research on public housing has been through several historical changes. Prior to 1981, HUD produced a yearbook of statistics on public housing authorities and its tenants. These data provided research opportunities to better understand public housing. The Statistical Yearbook was discontinued in 1981, and national level profiles of public housing have become almost nonexistent. In Holzman's historical account of factors impacting the "information gap" of research on public housing, two factors are considered of major importance: (1) the discontinuation of the HUD Statistical Yearbook; and (2) the lack of government-sponsored research on crime in public housing during the Reagan administration. The resulting reduction of public housing research continued into the early 1990's.

More recently, the research interest of the 90's was primarily in drug trafficking in large public housing authorities. Given that the trend for HUD public housing is smaller developments, the research on large developments is not congruent with the research needs for the public housing direction of smaller developments (Holzman, 1996).

Present Trends in Public Housing

Presently, the emphasis in public housing is to increase the livability of public housing and to increase accountability of its programs. In materials on changing the nature of public housing, HUD is searching for answers for improving the environment within public housing (1997). One change of direction in the public housing community was the demolition of over 30,000 units within a four year time frame ending in 1996 (1997). The current trend in public housing is an emphasis on architectural redesign with smaller, less densely configured low-rise and townhouse public housing developments. High-rise developments are a maintenance nightmare with elevators and plumbing accounting for the majority of high-rise maintenance budgets. Limited research indicates that big-city low-rise and townhouse

public housing are more vulnerable to some crimes (including gunfire and gang activity) than high-rise developments. Low-rise and townhouse public housing in rural and suburban areas do have lower crime rates, but the face of big-city crime is not the same (Holzman, 1996, and Zelon et al., 1994).

Current Research on Public Housing

In keeping with the trend of increasing accountability, an emphasis on research focusing on what is working well in public housing began in 1995. As stated by Stegman, Assistant Secretary for the HUD Office of Policy Development and Research, the department made an attempt to review evaluation research on violence prevention initiatives used in public housing developments. The task was to focus on programs that were successful in reducing access to firearms, conflicts between youth as individuals and as gang members, abuse of drugs, and drug trafficking. The conclusion was that there are numerous violence prevention programs, but there are very few evaluations of the programs (1997).

As stated by Holzman, HUD Program Evaluation Division, "valid statistics on the level of crime in public housing do not exist.... Even the largest public housing complexes typically represent small fractions of the specific geographic units for which official crime statistics are kept. Hence, our knowledge of the volume and type of crime in public housing and how crime in public housing compares to that found in other neighborhoods is woefully inadequate," (p. 331, 1998). Once procedures are devised, tested, and proven to reliably yield valid data, the effectiveness of crime control and treatment strategies can be evaluated (Holzman, 1999).

As a result of the scarcity of treatment and crime control evaluations in public housing, HUD shifted the emphasis from composing a document that assisted in implementing violence prevention initiatives to creating a manual on how to evaluate violence prevention efforts. The manual states that evaluation is needed in order to share information about what works with other agencies, improve programs' effectiveness, and demonstrate program effectiveness to the community and funding sources (1997). For measurement of a program's effectiveness, HUD suggests

using research methods that address outcome objectives such as (1) reduction of crime in a complex; (2) residents feeling safer; and (3) observation of desired changes in the neighborhood.

As listed in the HUD manual "A Guide to Evaluating Crime Control of Programs in Public Housing," a substantial problem in conducting evaluations in public housing is that housing authorities do not typically have an evaluation and research staff. The manual suggests that housing authorities hire outside evaluators (1997). Below the findings of the two suggested HUD sponsored evaluations mentioned in "A Guide to Evaluating Crime Control of Programs in Public Housing" are reviewed. Both evaluations make some attempts to address community violence in public housing. Also, two other HUD sponsored evaluations that address public housing community violence are reviewed. Particular attention is given to how community violence is measured and the identification of problems encountered in measuring community violence.

Research on HUD's Public Housing Drug Elimination Program

One area that has received much research interest is HUD's Public Housing Drug Elimination Programs. The research highlights the complexity of research in public housing. One HUD-sponsored evaluation conducted by Abt Associates Inc. between July 1991 and July 1993 examined the local Public Housing Drug Elimination Programs (PHDEP). The research is being included here because of (1) its attempts to measure drug-related crime in public housing and (2) measurement problems encountered by researchers gathering data in public housing developments. The programs were instituted in 1988 to help public housing authorities and Indian housing authorities combat drug use and drug-related crime in their developments. The amount awarded to 617 grantees between 1989 and 1991 was \$246,384,000. The grants varied in size from \$7,857 to \$12.5 million.

The evaluation consisted of a mail survey of all PHDEP programs and an intensive study of 15 local PHDEP programs. The surveys included questions regarding implementation of programming in five broad areas: law enforcement/security programming; treatment/intervention; physical improvements, prevention; and resident initiatives. The survey consisted

of two parts with part I composed of closed ended questions and part II composed of open ended questions. The response rate for the mail survey was 78 percent with 481 grantees responding. The final report on the evaluation states that no statistically significant differences were detected between programs that responded to the survey and those that did not in terms of housing authority size, geographic region and grant size. Inherent in the response rate is the indication that participation in the evaluation was apparently not mandatory for developments that had received grant money. According to Abt Associates Inc., evaluations of the programs' effectiveness were subject to all the weaknesses of self-reporting with no external validation of grantees' perceived effectiveness of programming and no consistent measures of effectiveness of programming across sites.

With major considerations for the limited quality of the data received by Abt Associates Inc., following are some of the comments from the report. Two percent of the programs included residents in planning and/or hiring decisions. Of the 134 grants in which resident patrols were to be implemented, fear of retaliation from drug dealers was

considered a reason for lack of resident participation. One-third of the resident patrols were not implemented in any way and some were stopped out of concern that the environment was too dangerous. Use of UCR data to report drug activity appeared to be more a reflection of resources for arresting dealers than for frequency of drug dealing activity. Housing developments characterized by high levels of open drug dealing with gang warfare, drive-by shootings, and intimidation were the least successful in implementing their programming. The common occurrence of gunfire was thought to impact residents' fear of anti-drug activities and to increase mistrust of housing authorities and police. The evaluation does indicate the need for a measure of community violence that is not influenced by participants' fear of getting hurt. Also, a measure of gunfire is needed.

According to Abt Associated Inc., the conditions in public housing are such that dramatic improvement can not be easily or quickly achieved. They considered the moderate or mixed success PHDEP achieved in Los Angeles and Chicago remarkable. Again, the process of measuring success was extremely inexact. The measures used were not considered reliable; therefore, the findings are not valid.

Research on Crime and Crime Prevention in Public Housing

A second HUD-sponsored evaluation by the Research Triangle Institute is the "Survey of Public Housing Residents: Crime and Crime Prevention in Public Housing" (1994). The HUD Office of Policy Development and Research (PD&R) contracted with the Research Triangle Institute to design and conduct a nationwide survey of public housing residents. The focus of the survey was (1) residents' perceptions of criminal activity, (2) opinions regarding the perceived effectiveness of various anti-crime initiatives, (3) levels of crime in public housing, and (4) perceptions of criminal activity.

The survey was conducted over a two-week period with over 1,500 public housing residents interviewed by phone. The aggregate response rate was 75%. The stratified random sample of telephone numbers was identified in stages with the initial phase involving the HUD selection of 25,510 addresses stratified by size of public housing authority, census region, and type of housing. The allocations to strata at this and later stages were in proportion to the population counts of public housing units indicated by HUD. From this list, a random sample of 12,755 addresses was

selected with 5,426 later being matched to telephone numbers. From that group of telephone numbers, 3,112 were selected for another stratified sample. From this group, 1,479 households completed the interview and 68 partially completed the interview. Of the remaining households selected in the stratified sample, 135 refused to participate, 515 telephone numbers were disconnected, 42 were wrong connections, 47 were ineligible, 268 addresses were incorrect, 110 spoke a language other than English or Spanish, and 441 households did not answer (1994). An obvious measurement problem regarding the implications of only surveying households with telephones is addressed later in this paper.

In attempting to measure aspects of community violence, the survey addressed individual factors of community violence that impact the safety of people. Findings of the survey include (1) the most commonly perceived crime problem was the presence of drug dealers with 48% of all respondents considering this as either a big problem or somewhat of a problem; (2) the second most frequently cited problem was people shooting guns; and (3) people living in low-rise mixed/family housing perceived the greatest problem with

gangs (1994). In an analysis of this research data by Holzman, Kudrick, and Voytek (1996), crime-related problems were highest for townhouse dwellers in the largest public housing authorities. A person shooting guns was the most frequently reported crime problem for people living in developments with over 501 units. Gunfire was a close second to drug dealing in small and medium size developments. The results indicate that gunfire in public housing is a problem. The frequency of gunfire was not measured.

The issue of telephone interviewing in public housing presents numerous complications regarding the validity of the collected data and how representative the data are of residents without telephones. The National Victimization Survey indicates that people without phones are at higher risk of victimization. However, for people living in public housing Holzman and Piper did not find a statistically significant difference in the victimization rates between people with and without phones (1998). They hypothesize that being nonwhite and on the very lowest end of the income distribution may create a type of vulnerability to victimization that does not vary much among residents. They

quickly point out that more replications of their research are needed since they were only focusing on two inner-city developments where homogeneity of the locale and physical characteristics of the respondents' housing may have influenced the results (1998). Also, in exploring telephone interviewing, they allude to Lynch's analysis of Klecka and Tochfarber's research (1978) in which Klecka and Tochfarber failed to reject the null hypothesis of no difference between victimization rates recorded by telephone interviews and victimization rates using the NCVS, which involves some in-person interviewing. In Lynch's analysis of the data, the null hypothesis was rejected in a two-tail test. The analysis indicates that telephone interviews produce estimates of victimization that are higher than in-person interviews (1993). The discrepancy in results calls into question both sets of results and indicates the need to more fully research questions about telephone interviews.

Holzman and Piper suggest that the uniqueness of the public housing population with respect to victimization may lead to some revisions of the conventional wisdom that in-person interviews obtain a higher degree of valid data. In their research, the mode of interviewing resulted in

significantly different rates of victimization. Telephone interviews resulted in significantly higher rates of victimization than in-person interviewing ($p < 0.05$, two-tailed test). They also indicated that victimization rates were higher when people were interviewed individually rather than when they spoke for others in their households. The victimization rates people recorded for others was lower than the rate listed when each person was individually interviewed (1998). With regard to measurement problems, caution is given that use of telephones for interviewing and speaking with only one spokesperson per family impacts the results of research.

HUD's Creation of an Instrument Measuring Victimization

To address methodological issues and research strategies in measuring crime in public housing, Holzman and Piper created the Victimization Survey of Public Housing Residents (VSPHR). The instrument is patterned after the National Crime Victimization Survey (NCVS), but the objective of the VSPHR project was to create an instrument and associated methodology appropriate for evaluating the effects of crime prevention programs in public housing

(1998). The VSPHR project was the first systematic attempt in public housing to apply the National Crime Victimization Survey approach to public housing. Modifications in the NCVS provide information about the type of public housing in which people live as well as more in depth data on the nature of crime in their housing developments. In contrast, the NCVS has only recently added a check box for people to identify themselves as living in public housing. With the VSPHR, questions are specifically asked about behaviors that endanger the safety of people in public places.

The goals of the VSPHR project were (1) to explore whether the NCVS approach would work in public housing where crime is a problem and (2) to develop tools for evaluating the effectiveness of crime prevention programs in public housing. Holzman and Piper consider the VSPHR project a step toward transferring the technology of the U.S. Census Bureau to a more usable tool for public housing authorities. Methodological issues and research strategies explored in the project included using the NCVS approach of purposive sampling for selection of developments; not paying respondents; and not paying participants in the research. Under "lessons learned," they suggest checking the

prevalence of telephones before deciding on the interview mode, and verifying of phone numbers so that wrong numbers do not take the place of correct numbers and thereby lead to under coverage of phone households (1998).

Like the NCVS, the VSPHR is a lengthy survey. The survey consists of 16 pages for the household respondent and 16 pages for each individual respondent in the home. In addition, the incident report is 19 pages. The survey asks questions about vandalism, acts of violence, theft, gunshots heard, and drug deals seen. A major problem is that interviews are costly and time consuming (Popkin et.al., 1998).

Research Using the VSPHR

The first official test of HUD's victimization survey (VSPHR) was implemented in the assessment of the Chicago Housing Authority's Henry Horner Homes Revitalization Initiative (1998). The test of the instrument demonstrated that (1) non-resident and resident interviewers could successfully administer the survey in public housing and the nearby community and (2) that respondents in public housing and the nearby communities were willing to cooperate. A

problem was discovered in obtaining data from respondents who had experienced multiple victimizations. People were reluctant to fill out an incident report for each victimization. As a result, a modification was made in the VSPHR with respondents filling out only one report for each type of victimization reported (Popkin et. al., 1998). The problems of interviews being costly and time consuming remained.

The research on the Henry Horner Revitalization Program addresses many aspects of community violence including gunfire. For this reason this paper provides more detailed information on this work. Also, the study is a major example of the important role research can provide in the effective use of money and resources. The assessment has given planners vital information on possible problems to consider in developing the additional \$1 billion allotted HOPE VI housing. The evaluation identifies factors that are potentially very important to the future success of some HOPE VI projects.

Evaluation of the early stages of the Horner Revitalization Program indicates many problems in the program. Large amounts of money are being spent to change

the architectural design of public housing, but other factors within the development have limited the successfulness of the program. Factors limiting the success of the HOPE VI Program include crime, lack of employment, lack of social cohesion in the community, and insufficient social and employment services. The VSPHR data provided by residents living in the newly designed development indicate that overall crime is about the same except that gang related crime is worse. "Periods of quiet are defined as days or weeks when less gunfire can be heard and few residents are shot - not times when the violence has ceased," (Popkin, et. al., p. 10, 1998). Victimization rates for people living in the Horner Development were 72 per 100. The victimization rate for people in the surrounding community was 44 per 100. Data from the in-person interviews indicate that victimization rates are highest for people living less than five years in the Horner Development and for people without telephones.

One concern expressed by the residents in the assessment is that security and services in the Chicago Housing Authority (CHA) property have decreased. In 1994, CHA spent approximately \$77 million on anti-drug programs

and security. The 1998 budget reduced the amount to \$39 million with 152 security officers being dismissed. The development looks much better architecturally, but the crime level has made it unlikely that people with higher incomes will choose to live in this community. People are skeptical that residents can work together to create a safer community. Seventy-seven percent of the respondents do not believe that "people in this neighborhood can be trusted," and neighbors are often perceived as potentially dangerous. Other findings indicate an unemployment rate of 42% and insufficient social and employment services. A needs assessment of community services mandated in the Mothers Guild decree indicates a lack of services, but no funds have been appropriated for services to address these needs (Popkin, et. al., 1998).

A related study recently completed by Popkin et al. consisted of a qualitative and quantitative longitudinal analysis of the Chicago Housing Authority's Anti-Drug Initiative. The Anti-Drug Initiative from 1994-1996 was Chicago Housing Authority's most in-depth attack on crime with an average of \$80 million spent each of the three years. The research was conducted between 1994 and 1996 in

three buildings in each of three developments including Henry Horner. Multiple methods used to assess the impact of the anti-drug programs included ethnographic observation of each development, a content analysis of the Chicago Sun Times and the Chicago Tribune from 1988 through 1996, six rounds of in-depth interviews with a small group of key residents, two rounds of interviews with staff implementing the anti-drug programs, and four waves of door-to-door surveys using the VSPHR.

The findings of the evaluation were not encouraging. The three main areas evaluated were (1) physical disorder, (2) social disorder, and (3) violent crime. Conditions worsened in all three areas. Conditions were better in 1995, but gains were quickly lost in 1996. Two factors were considered to impact the loss of improvements made in 1995. An unexpected increase in gang violence was attributed to arrest of many of the gang leaders. Residents indicated that weakening the leadership of one gang resulted in an increase in gang violence to reestablish the new gang leadership and turf. Similarly, the closure and demolition of some buildings created a gang power vacuum in neighboring areas that resulted in more crime. The results of changing

the nature of the gang activity actually worsened the crime conditions within the developments. The researchers hypothesize that the only solution may be demolition of the worst public housing. Their data indicate that 79% of residents living in low-rise housing and 85% of people living in high rise public housing would like to move to another type of housing, but this presents other problems. Chicago has limited resources in private housing and many of the residents in public housing have personal problems or crime histories that make them unwelcome in the private housing sector (Popkin, et al., 1999).

Additional findings further complicate the measure of program effectiveness. First, residents are very reluctant to report crime or even talk about levels of violence. The prevalent view appears to be that talking about things can get a person hurt. The researchers state that the levels of victimization recorded are most probably substantially underestimated. Secondly, households where someone worked for pay indicated the highest level of concern about social disorder, physical disorder, and violence. Thirdly, in two developments, victimization rates were higher in May than in

December for each of the three years measured (Popkin et al., 1999).

The findings of Popkin et al. reflect that measurement of community violence in public housing is very complicated (1999). Official crime counts do not come close to the actual levels of victimization mentioned by residents of some housing developments (Garbarino, 1997; Perry, 1997; Riechters & Martinez, 1993). Also, the processes of measuring individual levels of victimization are very costly (Popkin et al., 1998).

Research on "Hot Spots" in Public Housing Developments

In attempting to get a more manageable view of crime in public housing, Mazerolle and Terrill shift the focus from the entire public housing development to units of analysis in the development where crime is the most prevalent (1997). They call their focus a problem-oriented policing project that identifies specific locations within developments where most problems occur. In six public housing developments in Jersey City, New Jersey, random samples of residents were asked to identify areas they avoid because of high crime. They indicated that three-quarters of the common areas

identified as having violent crime are in low rise developments. Mazerolle and Terrill state that public housing sites need to be viewed according to the distribution of crimes within the development rather than the entire site being considered a crime "hot spot." They caution that each housing development is different and that one size fits all programming is very inappropriate. Crime within the area needs to first be analyzed before initiating crime control and prevention activities (1997).

A similar approach to identifying the "hot spot" areas within the public housing developments is crime mapping. In crime mapping the locations of reported crimes are recorded with areas having the most prevalent crime rates identified. Presently, research is being conducted in Charlotte, NC, and Memphis, TN, to further address measurement problems in identifying crime "hot spot" areas in public housing. In Charlotte, Rutgers University's Center for Urban Policy Research is working with the Charlotte public housing agency and the local police department to track 911 calls and police activities in order to identify crime "hot spots." A second part of their project is to develop software to map crime data in public housing. The software will be used to

identify "hot spots" which may appear as parking lots, individual apartments, or other public places. The hope is that resources can be more effectively utilized when the nature of crime in public housing is better understood (Holzman, 1999).

As mentioned previously in the review of research on public housing community violence, recurrent measurement problems include (1) many people in public housing do not report crimes, and (2) police activity in recording crimes in public housing, for offenses such as drug dealing, are often more a factor of allocation of police resources than frequency of drug trafficking behaviors. A related factor is indicated by Jeremy Travis, National Institute of Justice: repeat victimizations are highest in high crime areas, but repeat victims are less likely to notify police (1996). In 1999 crime mapping, Holzman considered the medical trauma reported at hospitals as the most valid source of crime data (1999).

Concerns Regarding Measures of Community Violence

In summary, measuring the level of community violence in many public housing developments is very complicated.

Gains have been made in measuring some factors of community violence. The Center for Disease Control Centers measures the number of murders in the United States and their National Electronic Injury Surveillance System continues to collect firearm-related injuries from a population-based sample of 91 emergency departments throughout the country. The Uniform Crime Report provides information regarding the crimes reported to the Federal Bureau of Investigation, and the National Crime Victimization Survey provides victimization data on general trends of victimization in the United States. Both provide massive sources of data regarding crimes and victimizations that occurred two years ago. More specifically, measures of victimization of residents in public housing continue to be developed. Measures of children's levels of victimization and exposure to violence also contribute important data. Presently, crime mapping is being developed to provide specific information on crimes reported in public housing. Many gains have been made in the area of measuring community violence, but the frequencies of many of the factors of community violence are unknown. For example, children and

adults often list gunfire as a concern, but gunfire is not measured in public housing.

Additional measures are still needed. As stated by Satcher et al.:

Given the great perceived urgency for addressing this problem (violence), it is not surprising that many people feel we must act right away, without taking time to await the result of calculated scientific trials. Urgency leads people to think there will be - indeed, that there must be - an answer that is simple and readily discoverable. Yet the results that are beginning to come forth suggest that the answer will not be so simple, discoverable, yes; simple, no.... Interventions must encompass individual and social factors (p. v, 1996).

Measures that are cost efficient and responsive to frequent changes in violence levels are needed. Having a measure of community violence that is sensitive to immediate changes in the nature of community violence would be helpful. For this measure at least to assess some factors of community violence during different times of a day or week would make possible a more appropriate allocation of

security resources. A time sensitive measure for a week could also provide valuable information about the effectiveness of interventions in a community. Being more informed regarding the level of violence in a particular community would make possible modifications in programming to better fit the safety needs of a community.

Regarding the effects of community violence on children living in public housing, we actually know very little about the levels of community violence in many developments. Having a better measure of the level of community violence would allow a better understanding of its impact on children. As indicted by Richters and Martinez, the term "community violence" is used with a vagueness that tells us very little about what is actually happening in a specific community (1993). As stated by Nunnally, the measurement validity of a variable is necessary before interrelations among variables can be examined (1978). Higher degrees of measurement validity are needed when measuring assaults, shootings, and verbal threats in public housing.

CHAPTER IV

Methodology

The guiding research question of this study was how valid are individuals' reports of gunfire in their communities.

Hypotheses

The following research hypotheses were formulated to better understand the validity of individuals' reports of gunfire:

1. A positive relationship exists between recorded counts of gunfire and individuals' reports of gunfire.
2. A relationship exists between recorded counts of gunfire and 911 calls about gunfire.
3. Individuals' reports of gunfire have a higher correlation with recorded gunfire than with 911 gunshot calls.
4. A relationship exists between individuals' reports of gunfire and reported assaults (two-tailed).

Rationale

A criterion validity study of individuals' reports of gunfire and recorded counts of gunfire is important for three reasons. The first reason is related to the lack of a comprehensive measure of community violence. Basic to the process of developing a comprehensive measure of community violence is the need to establish the criterion validity of indicators of community violence. Gunfire in a community is one indicator of community violence. The most frequently mentioned indicators of community violence are data from the Uniform Crime Report, the National Crime Victimization Survey and the Centers for Disease Control (CDC). These frequently used indicators provide important but limited information. *The Uniform Crime Report (UCR) underestimates the actual occurrence of violent activity.* The National Crime Victimization Survey (NCVS) suggests that only 62.4% of the crimes reported on the survey were reported to police. *The NCVS data also suggests that only 18.1% of the crimes of violence are reported in UCR data (2001).* The NCVS is limited in use in that it takes approximately 2 years to complete. Available information is not current nor

is it available for all areas. The information from the CDC is based on people being wounded and reporting to a hospital. No assumption is made that all victims of community violence report to a hospital. Thus, further indicators of community violence are needed to address these limitations. The need for additional clarity in the level of community violence is especially vital in communities where people do not report violence out of fear of retaliation (Travis, 1996).

The second reason for establishing the criterion validity for family reports of gunfire is that community leaders' response to gunfire reports are apt to be tailored by people who do not live in the designated community. If the perception is that people are sensationalizing the actual count, concerns may be less apt to be addressed. Similarly, if individual reports are considered more a reflection of what families hear on television programs than in their neighborhoods, interventions will address television programming or viewing times.

The third reason for establishing the criterion validity of family reports of gunfire is that over 50 percent of residents of larger public housing authorities

list gunfire as a major problem in the community (HUD, 1999). Many interventions have been implemented to reduce gunfire, but measurements to assess the effectiveness of these interventions are scarce. The most commonly used measure is to compare UCR data as pretest and posttest criteria. For community policing programs, which lists reporting of crimes as a major goal, an elevated UCR rate may be more an indication of community policing working rather than of an increase in community violence.

A major problem exists in evaluating the effectiveness of programs to improve the safety of communities with repeated episodes of random gunfire. As mentioned earlier, a comprehensive measure of community violence does not exist. Establishing the validity of individuals' reports of gunfire would be an initial step toward addressing the problem of random gunfire. In addition, Tolan et al. indicate that neighborhood monitoring and protection of youth are basic to reducing youth risk in high crime neighborhoods (2003). Identification of gunfire patterns would provide a tool for allocating safety and treatment resources to better meet needs.

Target Population

This study was conducted in two areas designated as gunfire "hotspots" by a local police department in the Southeast. The rationale for studying this population was that the areas were identified as having problems with random gunfire. The term "hotspot" was used by police departments to indicate that the designated areas had frequencies of gunfire 911 police calls that were 2 to 3 standard deviations above the norm for that city. Families living in a one-half mile radius of the designated hotspots were the target population.

Sampling

The sample size for this study was 116. For 116 days an instrument built for the purpose of recording gunfire was positioned to collect recordings of gunfire incidents. Each area consisted of a mixture of densely spaced apartments and more sparsely placed single family houses. In order to ensure that each household had an equal chance of being selected, a simple random sample was selected from each area. The two random samples were selected from a listing of telephone numbers in a one-half mile radius of

the "hotspot." If a family was unavailable, the next randomly selected family was interviewed. One adult from each selected family was asked about the gunfire frequency in the last 24 hours. All adult residents of the area were considered potential reporters. No children were interviewed. Interviews were conducted by telephone. Addresses with telephone numbers listed in the most current local City Directory provided the information for random selection.

Instrumentation

Four instruments were used in this study. One was a questionnaire that asked one adult in a family about recent gunfire activity in their neighborhood. Prior to asking any questions, individuals were assured that no identifying information would be recorded.

A second instrument recorded the occurrence and time of gunfire at a rooftop height. The sensor detected gunfire in an approximately one-half mile radius, depending on wind and background noise. Modification in the sensitivity of the instrument was reduced in order to decrease the likelihood of human voices being recorded. The instrument consisted of

a laptop computer adapted with the One Sensor ShotSpotter software and a Shotspotter sensor.

The third instrument was the publicly assessable data reported to the local emergency management center and to the local police department. This information included 911 calls reporting gunfire, reported assaults, and murders.

The fourth instrument was the local weather station's recordings of precipitation and atmospheric temperatures for each day.

Gunfire Detection Technology

The most difficult aspect of this research was obtaining appropriate equipment for conducting the research. This search for equipment took many forms. Initially the concern was getting a recording device that would record for at least 24 hours. An engineering student modified a VCR and a microphone in order to record for 24 hours. This presented privacy issues regarding the recording of human voices. This led to numerous consultations with engineers and physicists regarding filtering the recordings of sound waves. An environmental expert checked the possibility of using equipment that monitors sound pollution. Numerous

security consultants gave information on the latest security equipment used by law enforcement officials.

Two national trainers with the U.S. Federal Bureau of Investigation offered information on the latest technology for detecting gunfire. Two companies in the United States were mentioned by both consultants. Both companies were contacted, and each developer described their technology. The type of technology offered by one company detected gunfire within a building. This system only worked with the presence of solid walls to reflect sounds. The technology was used in a few prisons and other high security buildings where there was a heightened concern for the occurrence of gunfire.

The second company mentioned by the FBI consultants involved the use of equipment that identified gunfire incidents and made recordings of gunshots immediately available to law enforcement personnel. This technology was invented by Dr. Robert Showen, an electrical engineer and space physicist. He provided the concept and initial development of the ShotSpotter. ShotSpotter analyzes each pulse in a detected incident. Within 10 seconds after a shot is fired, the system alerts a dispatcher of the event.

A four-second sound recording is saved along with each incident. The annunciator beeps and flashes a small red light intermittently until a dispatch views the event and clears it. The entire location and notification process is completed within 6 to 10 seconds after the shot was fired. Within a few additional seconds the dispatcher listens to the sound and decides whether to dispatch an officer. The firm, Shotspotter, Incorporated was founded in 2002. The company has worked at various sites to reduce the levels of random gunfire. They received a contract from the U.S. Department of Justice for a double installation in Charleston and North Charleston, South Carolina in 2003.

The need for this study was technology that could filter human voices, record the sound of gunfire, and keep recorded information highly confidential. In January, 2003, Dr. Showen stated that he thought it would be possible to modify ShotSpotter for use as a single sensor. He and Dr. Robert Calhoun modified the software and a laptop computer for use in this study. The equipment was received July 3, 2003.

The sensor began recording data in January, 2004. The main problem at the first site was basic use of the system.

There were minor problems related to use of the equipment, but even minor problems resulted in loss of recording days. A simple problem could shut down the research. The main problem in use of the equipment at the first site was the learning curve for the person conducting the study. Gaining familiarity with use of the equipment was important. Technical assistance by phone addressed technical problems. The One Sensor Shotspotter recorded close gunfire with clarity. The occurrence of bottle rockets, firecrackers bricks, or thunder were distinguished from gunfire by the sounds of the recordings and by the appearance of waveform plots.

The first site (area A) was at the corner of a location that was considered a "hotspot" for gunfire activity. The placement of the Shotspotter equipment was based more on concern for not getting the equipment stolen than for proximity to gunfire. The device was placed in a highly secure business that had a history of no break-ins. The business had double security fencing. Doors were electronically controlled and motion sensors were placed throughout the building. The plus of this location was very little concern about the safety of the equipment. The

problem was that only gunfire in close proximity to this business was recorded. The initial recordings indicated 25, 8, 3, and 17 shots in the 2:00 a.m. to 4:00 a.m. time frame for the first four days of recording gunfire. The gunfire was easily distinguished by the appearance of waveform plots and the sounds on the recordings.

A problem was that the sensor did not pick up gunfire .5 mile from the sensor. Three gunfire assault emergency calls occurred close (within .25 mile) to the site and had corresponding gunfire recordings on ShotSpotter. Two emergency gunfire calls for service from distances closer to .5 mile did not have corresponding gunfire recordings on the Shotspotter equipment. The building with the attached sensor was located in the lowest region of the neighborhood. This was against the advice of Dr. Showen, but the overriding concern was protection of the equipment. Placing the sensor in a valley appeared to reduce the ability of the sensor to pick up gunfire at the apartment buildings located at the far end of area A. A change in sensitivity settings in the Shotspotter equipment also resulted in decreasing the range covered by the Shotspotter sensor. This was not reversed due to concerns regarding

recording human conversation. The equipment did record unintelligible yells during some gunfire recordings. A corresponding data collection problem for the area around the apartment buildings was that the City Directory listed less than 5 phone numbers for people living in that housing development. The gunfire activity in that region of area A was therefore not reflected in either the ShotSpotter or interview data.

At the second site the sensor was placed on a very tall building. A major problem at that site was picking up AM radio frequency waves. Lt. Robert Hubbs, a consultant from the Charleston project, suggested adding ferrite data line radio frequency filters. This reduced the level of radio program recordings to less than 5% of the data collected. A second problem was finding a location away from air conditioning units. The sensor was moved twice to increase distance from the units and reduce white noise.

Data Analysis

A survey design was used for the data collection of interview information. Originally, the plan was to evaluate correlations between the independent variable, recorded

gunfire, and residents' reports of gunfire. The types of statistical procedures used in this study were changed due to the correlation between current and previous gunfire recordings. The observations of recorded gunfire were not independent of each other.

The statistical procedures used to evaluate relationships between recorded gunfire and residents' responses involved the following steps:

1. diagnosing the series of recorded gunfire for autocorrelations and periodicity;
2. identifying the model for the series of gunfire recordings using the autoregressive integrated moving average (ARIMA) function;
3. using the ARIMA function to determine variable coefficients and levels of significance for the independent and control variables.

ARIMA analyses were used to examine the relationships between recorded gunfire and residents' reports of gunfire for three different time frames: the 24 hours prior to the interview, the hours between 5:01 p.m. and 12:00 a.m., and the hours between 12:01 a.m. and 5:00 a.m.

Pearson and Spearman's rho correlations were used to examine relationships between 911 data and residents' responses.

CHAPTER V

Results

The data from this study were analyzed and ordered according to presence of gunfire, time of gunfire, patterns of gunfire, and emergency calls for help dealing with gunfire. Data from the interviews, ShotSpotter, and 911 emergency calls were analyzed for relationships among the variables. This indicated whether the data did or did not support the hypotheses of this study.

For this study 342 people were interviewed by telephone using the study questionnaire. (See appendix A). A one-sensor ShotSpotter collected gunfire recordings for 119 days in the two areas where the respondents lived. The two selected areas were identified by police crime reports as having moderate difficulty with gunfire.

Presence of Gunfire

The dependent variable for this study was the number of gunshots recorded by a ShotSpotter device. Most of the measures of independent variables were based on the residents' responses to interview questions.

ShotSpotter Data Results

The range of number of gunshots recorded was from zero to 65, with zero being the mode. (See Table 6). At the first site (Area A), a police intervention occurred six days after data collection began. The gunfire activity almost stopped completely in this area. The day prior to the increased police activity, 16 shots were recorded from 3:10 a.m. to 3:58 a.m. Following the intervention very little gunfire was recorded for the remaining 50 days of ShotSpotter data collection in this area. During the data collection time frame, this area was targeted for economic development with many funding sources included. Also, Habitat for Humanity began construction on two houses. The first ten days of gunfire recordings were not included due to an excessive amount of missing data (76%). Initial missing data were due to getting everything to work at the same time. Then, due to the low variability in the range of gunfire data from Area A, it was not possible to accurately calculate correlations and ARIMA analyses from Area A data.

As indicated by Figure 6.1, restriction of range was not a problem in Area B. Gunfire recording data from Area B were used in computing ARIMA analyses and correlations with

Table 6. Frequency Distribution of Daily Gunfire Counts

Gunfire Counts	Frequency	Cumulative Percent
.00	55	46.2
1.00	5	50.4
2.00	5	54.6
3.00	7	60.5
4.00	6	65.5
5.00	2	67.2
7.00	7	73.1
8.00	4	76.5
9.00	2	78.2
10.00	1	79.0
11.00	4	82.4
12.00	3	84.9
13.00	1	85.7
15.00	2	87.4
16.00	1	88.2
17.00	1	89.1
20.00	1	89.9
21.00	1	90.8
26.00	2	92.4
27.00	3	95.0
40.00	1	95.8
42.00	1	96.6
49.00	1	97.5
60.00	1	98.3
64.00	1	99.2
65.00	1	100.0
Total	119	

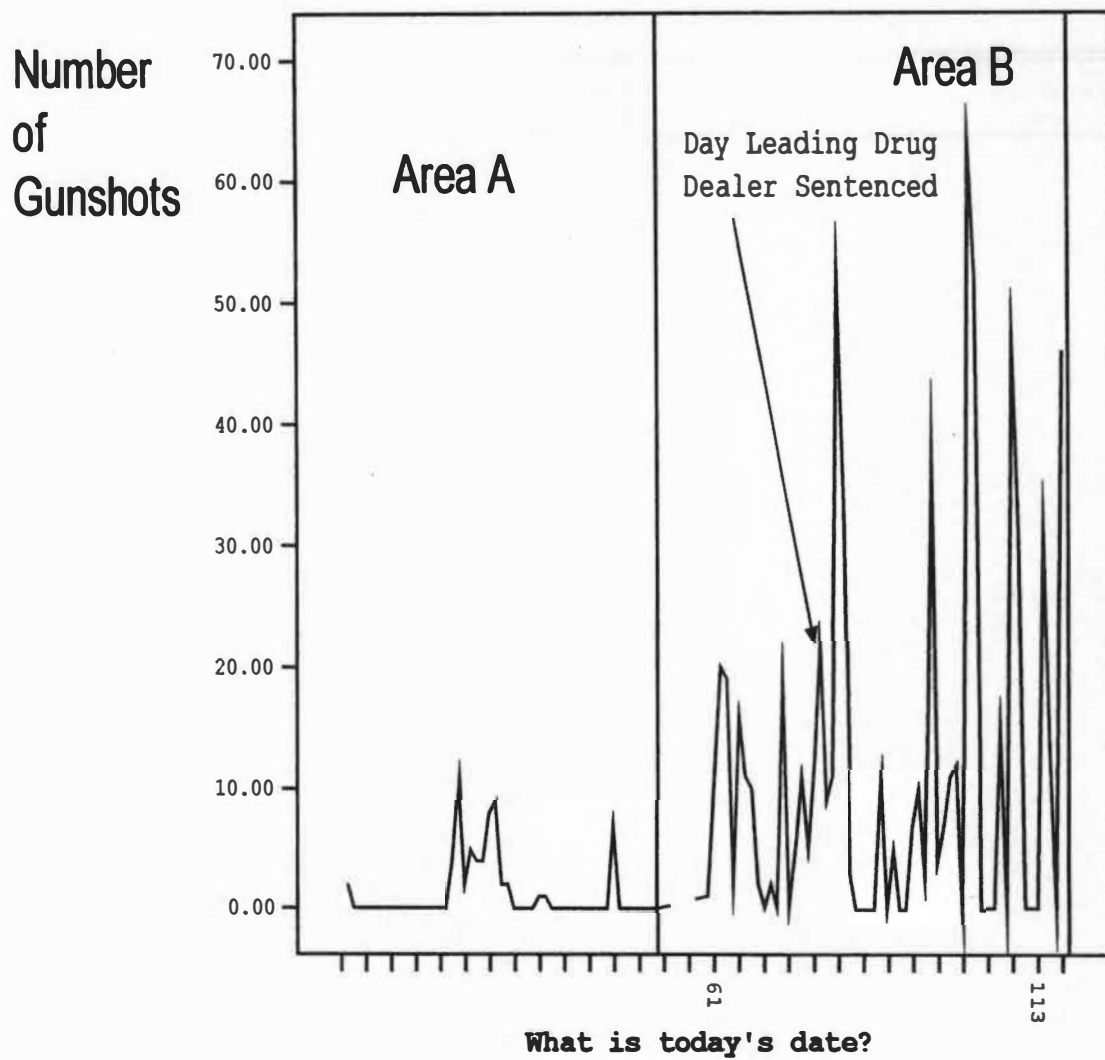


Figure 6.1 Gunshots in Area A and Area B

independent variables. The second site (area B) had a higher density of homes as well as a government housing development. From viewing media reports, there appeared to be little economic interest in developing this area. Crime data seemed to indicate that the area had a more serious gunfire problem. Three weeks into recording data in area B, gunfire activity appeared to substantially increase. The increase in numbers of gunshots began the day a few leading people in the drug business were sentenced for lengthy prison stays. Since there were no controls or measures for activity in the selected site, the gunfire increase could have been due to many other factors not presently known. In addition, during two late night gunfire checks, the gunshots appeared to be coming from a community park. This differed from views that the gunfire was primarily coming from areas in the housing development. Consistent with earlier communication with residents, most shots seemed to be aimed into the air, not at anything or anyone. The late night gunfire checks only occurred two nights and were therefore not significant in terms of location.

Patterns of Recorded Gunfire

Gunfire recordings were much more prevalent at night, with 94.5% of the gunfire recordings occurring at night, and only 5.5% recorded during the day. Most of the shot recordings occurred very late at night or in the very early morning. Most shots occurred in rapid succession, with several shots being recorded in a small frame of time. For example, during one 24 hour span, 28 shots were recorded in the seven minutes between 2:33 a.m. and 2:40 a.m. As is addressed below, gunfire recordings were more prevalent on Saturday and Friday nights. No gunfire was recorded during rainy weather.

Interview Results

Of the 342 people interviewed, 148 lived in area A and 194 in area B. The respondents were randomly selected from listings in the City Directory. In the first sample, 139 of the 148 respondents in area A lived in houses, and seven in apartments. In the second sample 85 of the 194 respondents in area B lived in houses, and 103 in apartments. A problem with data collection was that the City Directory's listings were not representative of the community. The Directory

listed less than 10 phone numbers for people living in a government housing development located in area B. Of the people interviewed, 97.9% of the respondents had lived in their homes for over three years and the remaining 2.1% from one to three years. People who lived in their homes less than three years were underrepresented in the sample.

Time of Day

Of the 340 people answering the question, "Do you ever hear gunshots in your neighborhood," 338 answered "yes," and only two answered "no." To get a better idea of whether people heard gunshots during the traditional hours for sleep, respondents were asked if gunfire ever bothered their sleep. Eleven people (3.3%) responded that gunfire had not bothered their sleep, and 320 people (96.7%) responded that it had. For the question asking the time of day when a person was most likely to hear gunfire, 334 people said "night" and only two responded "day." This was consistent with the ShotSpotter data which indicated that 94.5% of the gunfire recordings occurred at night. Many of the night recordings also included multiple shots. These results were consistent with the hypothesis that a positive relationship

existed between recorded counts of gunfire and individuals' reports of gunfire.

Day of Week

People were asked to identify the day of the week when they were most likely to hear gunfire. Even though asked which "day" they heard the most gunfire, many people responded with multiple days, most especially "Friday" and "Saturday." The most frequent response was Saturday, with 70.7%. Table 7 summarizes subjects' responses. This table includes some multiple responses from persons, such as their responses that they heard the most gunfire on Friday and Saturday. The responses from residents were consistent with data recorded by ShotSpotter. Shotspotter data also indicated that there were more shot recordings on Saturday than for any other day of the week. The sum of ShotSpotter recordings for each day of the week ranged from 38 shots on Monday to 335 shots on Saturday, as shown in Table 8. ShotSpotter data indicated the highest mean for Saturday, $M = 19.71$ ($SD = 24.69$). Means for other days of the week were Monday, $M = 2.37$, ($SD = 5.10$); Tuesday, $M = 3.60$, ($SD =$

Table 7. Which Day Do People Hear the Most Gunfire?

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
2	0	1	1	219	256	11

Table 8. ShotSpotter Recordings for Each Day of the Week

What is the day of the week?	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Monday	16	.00	20.00	38.00	2.3750	5.09738
Tuesday	15	.00	16.00	54.00	3.6000	5.52656
Wednesday	17	.00	27.00	105.00	6.1765	8.95988
Thursday	16	.00	27.00	95.00	5.9375	7.78433
Friday	16	.00	49.00	101.00	6.3125	13.11853
Saturday	17	.00	65.00	335.00	19.7059	24.69252
Sunday	17	.00	21.00	85.00	5.0000	6.33443

5.53), Wednesday, $M = 6.18$, ($SD = 8.96$); Thursday, $M = 5.93$, ($SD = 7.78$); and Friday, $M = 6.31$, ($SD = 13.12$).

In this study data from both the interviews and SpotShotter indicated that Saturday was the day of the week with the highest level of gunfire. This was supportive of the hypothesis that a positive relationship existed between recorded counts of gunfire and individuals' reports of gunfire.

Evaluation of Autocorrelations in the Dependent Variable

Before continuing to evaluate the relationship between residents' reports of gunfire and recorded counts in Area B, a concern was that observations of the dependent variable, recorded gunshots, were not independent of previous gunfire recordings, i.e., that the count data were autocorrelated. An analysis of the autocorrelation structure in the ShotSpotter data was conducted using procedures described by Ostrom (1990) and McDowell, McCleary, Meidinger, and May (1980). Of the 65 days of data collection in Area B, seven days had missing data. During those days, AM radio frequency wave disruptions were a major problem. Then, a

connector on the adapted ShotSpotter laptop broke. The seven days of missing data occurred sequentially.

Diagnosis of Autocorrelations

The autocorrelation function was estimated using SPSS. The plot for this function is shown in Figure 6.2. The autocorrelation function showed significant spikes at days seven (.271) and 21 (.321). These residuals suggested a seasonal autocorrelation with a seven-day periodicity (AR seasonal) component (Ostrom, 1990).

Identifying the Autocorrelation Model

Following Ostrom (1990) and McDowell, et al., (1980), an ARIMA (0,0,0)(3,0,0) model was tried to describe mathematically the process generating the autocorrelations. (See Table 9). As indicated in Figure 6.3 the use of the seven-day periodicity (AR seasonal) component appeared to account for the seven-day cycles. As seen in Table 9, the results of fitting an ARIMA (0,0,0)(3,0,0) model indicated that a lag three (SAR3) seasonal autocorrelation was statistically significant. The residuals analysis suggested that an ARIMA (0,0,0,)(3,0,0) model appeared to specify the

Residuals for 24 Hours of Gunshots

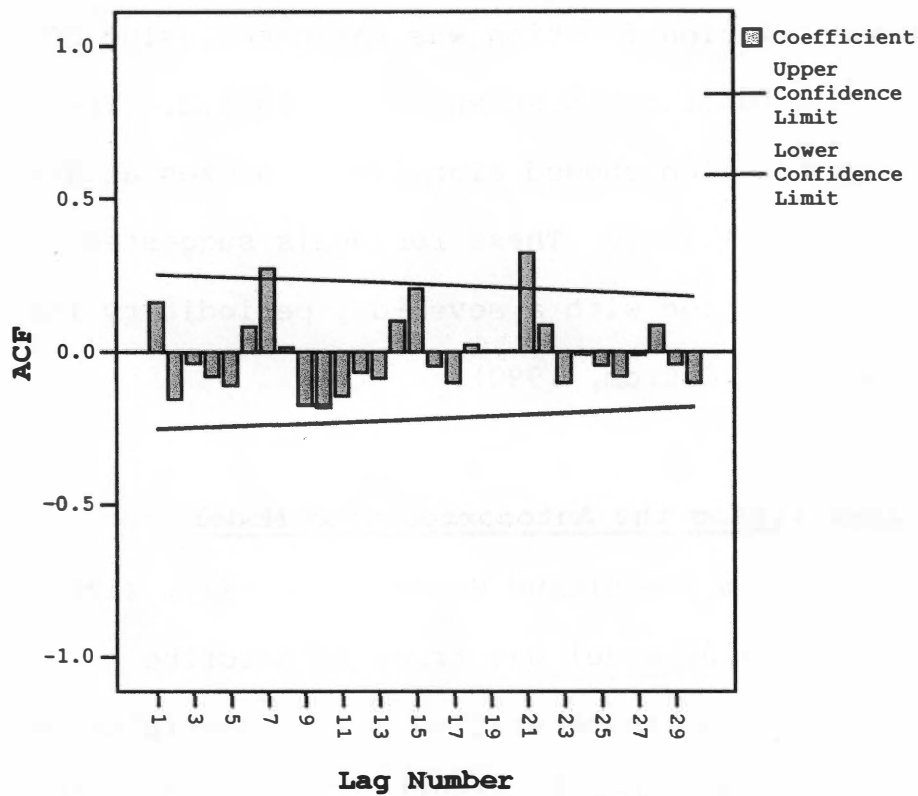
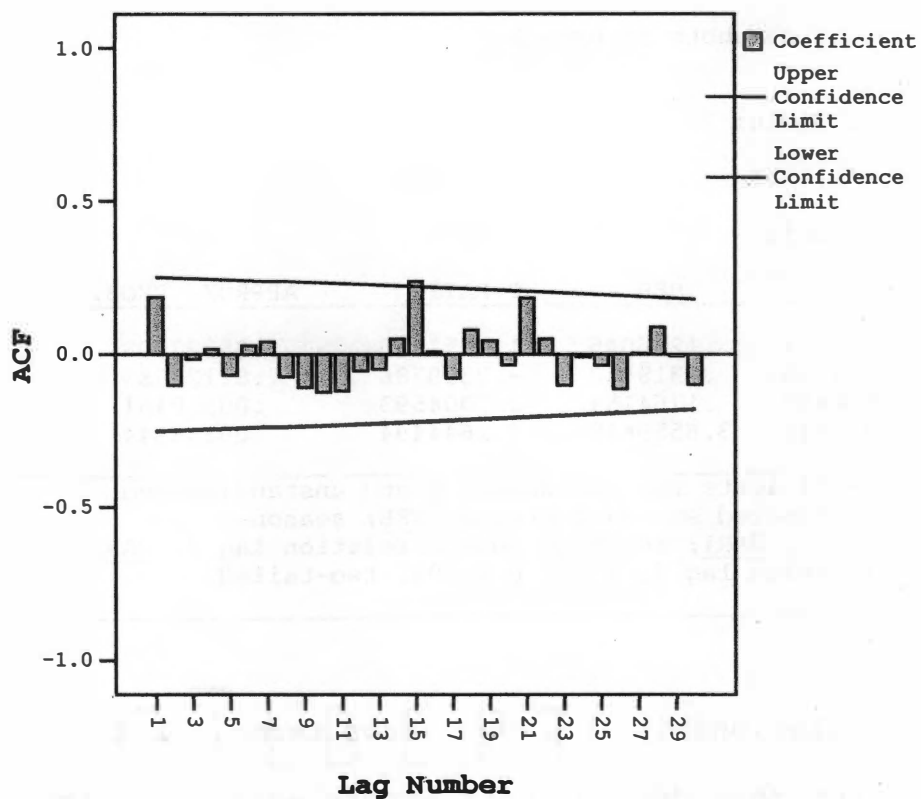


Figure 6.2. Recorded Gunfire Autocorrelations

**Residuals for 24 Hours of Gunshots with ARIMA
(0,0,0) (3,0,0)**



**Figure 6.3 Autocorrelations for Recorded Gunfire ARIMA
(0,0,0) (3,0,0)**

Table 9. ARIMA 1: Model for Recorded Gunfire
(0,0,0) (3,0,0)

Model Description:

Variable: Recorded Gunshots in Area B
 Regressors: None

Length of Seasonal Cycle: 7

Number of residuals: 58

Variables in the Model:

	B	SEB	T-RATIO	APPROX. PROB.
SAR1	.238211	.1206045	1.9751455	.05327908
SAR2	-.031635	.1318482	-.2399386	.81126985
SAR3	.476403	.1764154	2.7004593	.00918451
CONSTANT	11.934712	3.6559648	3.2644494	.00188944

Unstandardized coefficients for variables, B and unstandardized coefficients for estimated standard errors, SEB; seasonal autocorrelation lag 1, SAR1; seasonal autocorrelation lag 2, SAR2; seasonal autocorrelation lag 3, SAR3; $p < .05$, two-tailed.

nature of the relationships between error terms. With the parameters of the recorded gunshots errors estimated, the relationships between recorded gunfire and residents' responses were analyzed.

Presence of Gunfire in the Last 24 Hours

Residents identified a general presence of gunfire, the time of day when gunfire was more likely, and the day of the week when gunfire was more prevalent. ARIMA analyses were conducted to further test the relationship between

residents' responses regarding gunfire and recorded gunfire during three time frames: daily, night time, and early morning. Daily count was defined as the total number of recordings within the 24-hour interview time frame. Night time shots were defined as between 5:01 p.m. and 12:00 a.m. Early morning shots were defined as the total recorded between 12:01 a.m. and 5:00 a.m. An interview day was defined as the 24 hours prior to the resident's interview. Additional ARIMA analyses were conducted with weather variables that might potentially impact the amount of gunfire. Consistent with the original hypothesis stating that a positive relationship existed between recorded counts of gunfire and residents' responses, a directional hypothesis test was used to indicate statistical significance. The analyses between weather variables and recorded gunfire were nondirectional since either positive or negative results could be informative. With the ARIMA (0,0,0) (3,0,0) autocorrelation function controlling for the seven day periodicity, the following ARIMA analyses were conducted:

ARIMA 2. DV: Area B gunfire recordings

IV: Average number of gunshots reported by

residents

IV: Percentage of residents reporting the
presence of gunfire;

ARIMA 3. DV: Area B gunfire recordings

IV: Low temperature

IV: High temperature

IV: Precipitation-

The results from ARIMA 2 indicated that people's reports of gunfire in the last 24 hours were not statistically significant. When controlling for seasonal autocorrelations, numbers of gunshots reported by residents did not appear valid (i.e. $B = -.300$, $t = -.129$, $p > .05$, one-tailed). When controlling for seasonal autocorrelations, the percentage of people reporting the presence of gunfire also did not appear valid (i.e. $B = .067$, $t = .928$, $p > .05$, one-tailed). For the 24-hour time frame, residents' reports did not appear to be valid indicators of recorded gunfire. (See Table 10).

Similarly, for the 24 hour time frame, none of the weather variables were considered statistically significant indicators of recorded gunfire ($p < .05$). (See Table 11).

Table 10. ARIMA 2: Gunshots During 24 Hours and Residents' Responses (N = 58)

Variables in the Model:

	B	SEB	T-RATIO	APPROX. PROB.
SAR1	.2297796	.1259546	1.8243040	.07385416
SAR2	-.0208277	.1367420	-.1523138	.87952891
SAR3	.4626528	.1889792	2.4481674	.01776909
avereport	-.2995292	2.3131764	-.1294883	.89747089
%hearing	.0668922	.0720798	.9280289	.35768037
CONSTANT	9.5847177	4.2296334	2.2660871	.02763568

Unstandardized coefficients for variables, B and unstandardized coefficients for estimated standard errors, SEB; seasonal autocorrelation lag 1, SAR1; seasonal autocorrelation lag 2, SAR2; seasonal autocorrelation lag 3, SAR3; $p < .05$, one-tailed.

Table 11. ARIMA 3: Gunshots During 24 Hours and Weather Variables (N=58)

Variables in the Model:

	B	SEB	T-RATIO	APPROX. PROB.
SAR1	.246433	.159800	1.5421349	.12934668
SAR2	-.043812	.162858	-.2690172	.78902343
SAR3	.347874	.203549	1.7090442	.09364374
hightemp	-.296424	.422808	-.7010853	.48649999
lowtemp	.346788	.405503	.8552047	.39651738
rain	-10.030079	5.062243	-1.9813508	.05306433
CONSTANT	17.271677	22.642629	.7627947	.44916978

Unstandardized coefficients for variables, B and unstandardized coefficients for estimated standard errors, SEB; seasonal autocorrelation lag 1, SAR1; seasonal autocorrelation lag 2, SAR2; seasonal autocorrelation lag 3, SAR3; $p < .05$, two-tailed.

For the 24 hour time frame, weather variables were not considered reliable predictors of gunfire for the entire day.

Identification of Night Recorded Gunfire Counts

The pattern of autocorrelations for night gunfire was similar to the patterns for the 24-hour time frame of gunfire. The autocorrelation and partial autocorrelation functions identified statistically significant seasonal autocorrelations at lags two and three (see Figures 6.4 and 6.5). As with the 24-hour time frame of gunfire recordings, periodicity was seven days. These results suggested an ARIMA (0,0,0)(3,0,0) model. The results of fitting this model are shown in Table 12. Using this ARIMA model for night recorded gunfire the Box Ljung statistics for the ACF function were statistically nonsignificant for all lags. As seen in Table 12, the lag two (SAR2) and lag three (SAR3) seasonal autocorrelations were statistically significant ($p < .05$, two-tailed). The ARIMA (0,0,0)(3,0,0) model appeared to account for the process generating the errors for night-recorded gunfire.

Residuals for Night Recorded Gunfire

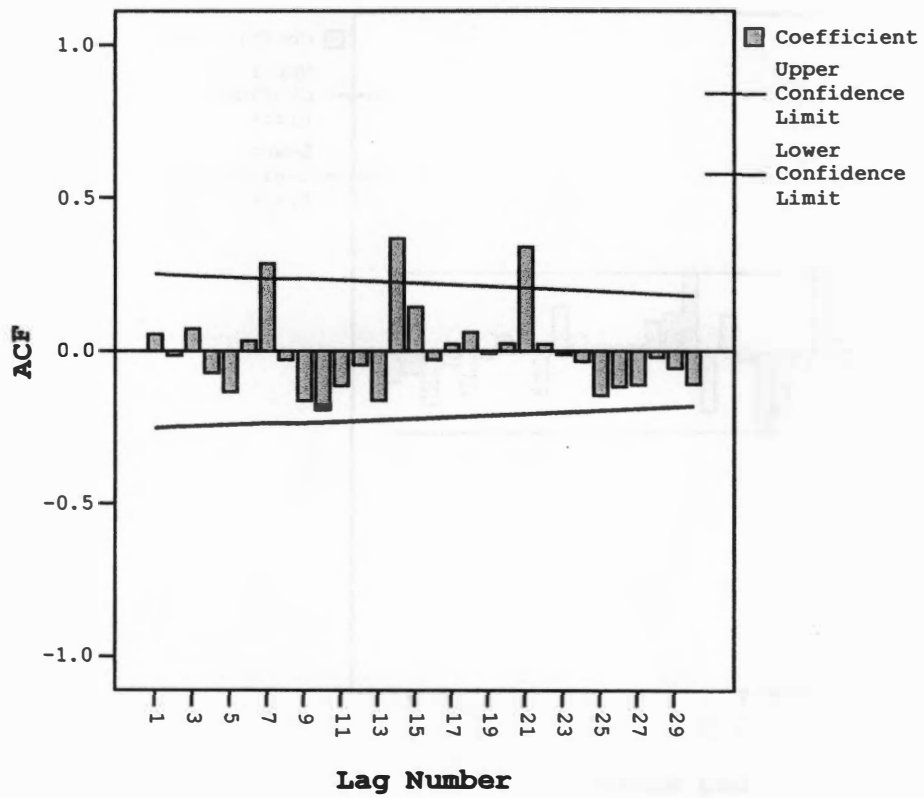


Figure 6.4 Autocorrelations for Night Gunfire

Residuals for Night Recorded Gunfire

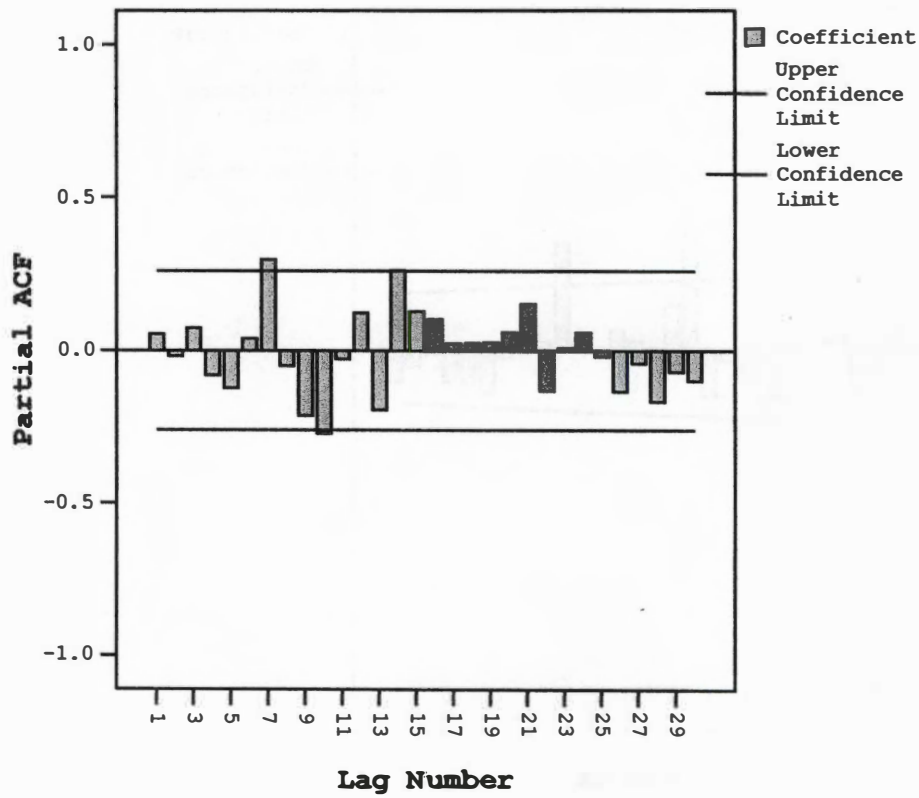


Figure 6.5 Partial Autocorrelations for Night Gunfire

Table 12. ARIMA 4: Night Gunshots (0,0,0) (3,0,0) Model

Model Description:

Variable: gunshots recorded during night (5:01 p.m. to 12:00 a.m.)

Length of Seasonal Cycle: 7 days

	B	SEB	T-RATIO	APPROX. PROB.
Variables in the Model:				
SAR1	.0591142	.1328227	.4450609	.65802243
SAR2	.3155978	.1316211	2.3977743	.01991673
SAR3	.3920438	.1770170	2.2147242	.03094047
CONSTANT	6.3099845	2.5964872	2.4302005	.01838094

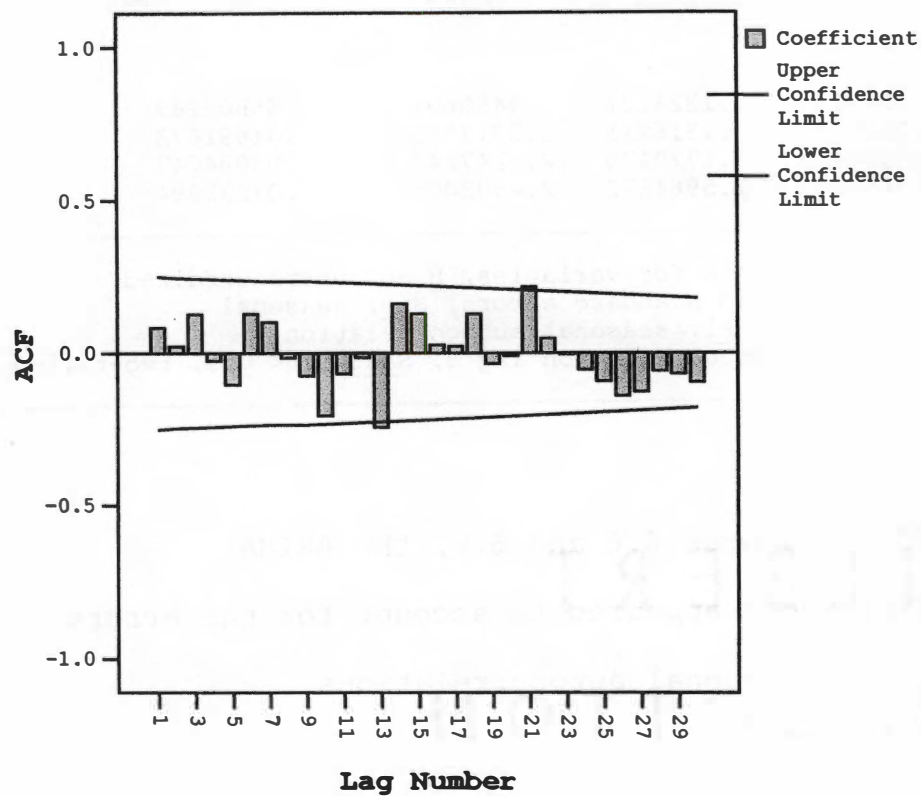
Unstandardized coefficients for variables, B and unstandardized coefficients for estimated standard errors, SEB; seasonal autocorrelation lag 1, SAR1; seasonal autocorrelation lag 2, SAR2; seasonal autocorrelation lag 3, SAR3; $p < .05$, two-tailed.

As indicated by Figures 6.6 and 6.7, the ARIMA (0,0,0) (3,0,0) model appeared to account for the errors generated by the seasonal autocorrelations.

Gunfire Between 5:01 p.m. and 12:00 a.m.

ShotSpotter recordings indicated that 53.14% of the total recorded gunshots for a day occurred between 5:01 p.m. and 12:00 a.m. ($M = 3.81$, $SD = 7.80$). It was predicted that people's reports of gunfire might be related to the time of day the shots were recorded. To further clarify the

**Residuals for Night Gunshots ARIMA (0,0,0)
(3,0,0)**



**Figure 6.6 Autocorrelations for Night Recorded Gunfire
ARIMA (0,0,0)(3,0,0)**

**Residuals for Night Gunshots ARIMA (0,0,0)
(3,0,0)**

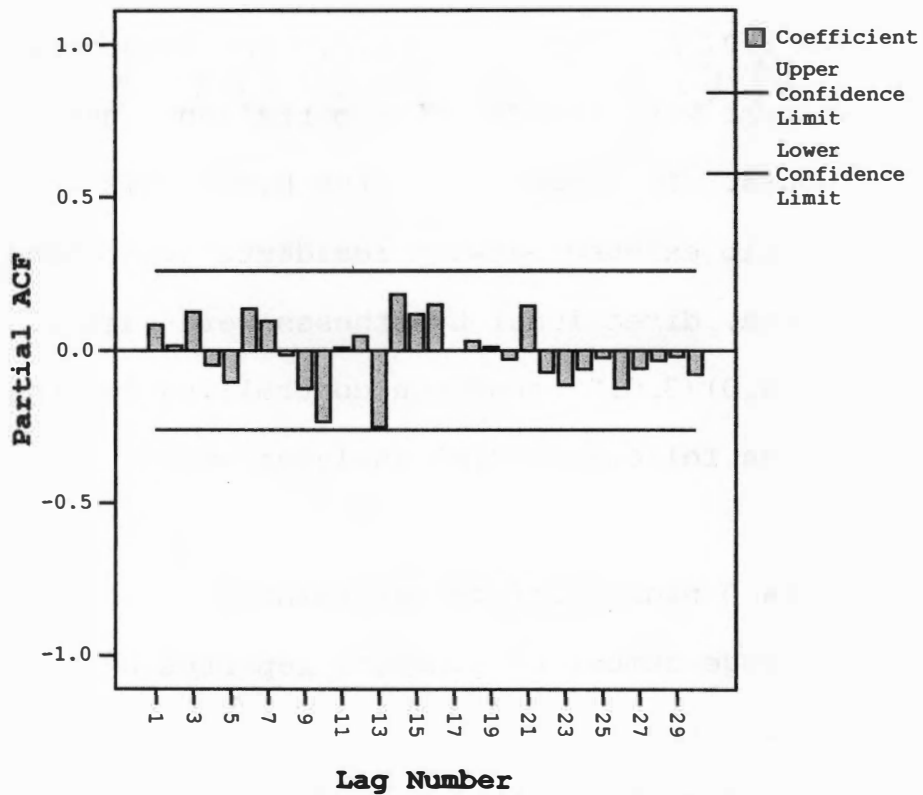


Figure 6.7 Partial Autocorrelations for Night Recorded Gunfire (0,0,0)(3,0,0)

recorded counts of gunfire, the following two analyses were relationship between residents' responses about gunfire and conducted. The dependent variable was recorded gunshots occurring between 5:01 p.m. and 12:00 a.m. The independent variables of interest were residents' reports about gunfire in the last 24 hours. In keeping with the hypothesis that a positive relationship existed between residents' responses and recorded gunfire, directional hypotheses were tested. With the ARIMA (0,0,0)(3,0,0) function controlling for the 7 day periodicity, the following ARIMA analyses were conducted:

- ARIMA 5. DV: Area B night gunfire recordings
IV: Average number of gunshots reported by residents;
- ARIMA 6. DV: Area B night gunfire recordings
IV: Percentage of residents reporting the presence of gunfire;
- ARIMA 7. DV: Area B night gunfire recordings
IV: Low temperature
IV: High temperature
IV: Precipitation
- ARIMA 8. DV: Area B night gunfire recordings

IV: Percentage of residents reporting the
presence of gunfire

IV: High temperature

IV: Precipitation-

Results from ARIMA 5 are shown in Table 13. As indicated, the relationship between the average number of gunshots reported and ShotSpotter counts did not appear statistically significant. When controlling for seasonal autocorrelations, the average number of gunshots reported by residents did not appear to be a valid predictor of the number of gunshots recorded ($\underline{B} = 1.72$, $\underline{t} = 1.70$, $\underline{p} > .05$, one-tailed).

The results from ARIMA 6 indicated that the percentage of persons reporting the presence of gunfire was a statistically significant predictor of the presence of night gunshots. When controlling for seasonal autocorrelations, the percentage of people reporting the presence of gunfire appeared to be a valid predictor of the presence of night gunfire (i.e. $\underline{B} = .070$, $\underline{t} = 2.28$, $\underline{p} < .05$, one-tailed). (See Table 14).

For the hours between 5:01 p.m. and 12:00 a.m., the absence of precipitation appeared to be a statistically

Table 13. ARIMA 5: Average Gunshots Reported (N = 58)

Variables in the Model:

Dependent variable: Gunshots recorded during night (5:01 p.m. to 12:00 a.m.)

	B	SEB	T-RATIO	APPROX. PROB.
SAR1	.0990359	.1471133	.6731946	.50380460
SAR2	.3033491	.1401459	2.1645230	.03503725
SAR3	.3534431	.1986623	1.7791155	.08106594
avereport	1.7190422	1.0111360	1.7001097	.09508494
CONSTANT	5.5417319	2.6231197	2.1126493	.03945082

Unstandardized coefficients for variables, B and unstandardized coefficients for estimated standard errors, SEB; seasonal autocorrelation lag 1, SAR1; seasonal autocorrelation lag 2, SAR2; seasonal autocorrelation lag 3, SAR3; $p < .05$, one-tailed.

Table 14. ARIMA 6: Percentage of People Reporting Gunfire Present (N = 58)

Variables in the Model:

Dependent variable: Gunshots recorded during night (5:01 p.m. to 12:00 a.m.)

	B	SEB	T-RATIO	APPROX. PROB.
SAR1	.0857177	.1320905	.6489315	.51918482
SAR2	.2773341	.1329348	2.0862409	.04178494
SAR3	.4068705	.1743661	2.3334266	.02345187
%hearing	.0698681	.0306264	2.2813056	.02657561
CONSTANT	3.7948022	2.8077974	1.3515228	.18226862

Unstandardized coefficients for variables, B and unstandardized coefficients for estimated standard errors, SEB; seasonal autocorrelation lag 1, SAR1; seasonal autocorrelation lag 2, SAR2; seasonal autocorrelation lag 3, SAR3; $p < .05$, one-tailed.

significant predictor of recorded night gunfire (i.e.

$B = -6.63$, $t = -2.34$, $p < .05$, two-tailed). (See Table 15).

The ARIMA 8 analysis further examined the percentage of people reporting the presence of gunfire when controlling for seasonal autocorrelations, high temperature, and precipitation. The percentage of people reporting the presence of gunfire was again statistically significant (i.e. $B = .087$, $t = 2.78$, $p < .05$). As indicated by Tables 14 and 16, regardless of what independent variables were included in the model, the percentage of residents reporting

Table 15. ARIMA 7: Weather Variables and Night Recorded Gunfire (N = 58)

Variables in the Model:

Dependent variable: Gunshots recorded during night (5:01 p.m. to 12:00 a.m.)

	B	SEB	T-RATIO	APPROX. PROB.
SAR1	.149089	.150121	.9931224	.32543235
SAR2	.315668	.148669	2.1232901	.03870161
SAR3	.247310	.197983	1.2491483	.21742731
lowtemp	.203014	.231326	.8776076	.38435429
hightemp	-.379915	.245049	-1.5503614	.12736195
rain	-6.625945	2.834452	-2.3376458	.02344894
CONSTANT	26.739945	13.101247	2.0410229	.04654481

Unstandardized coefficients for variables, B and unstandardized coefficients for estimated standard errors, SEB ; seasonal autocorrelation lag 1, $SAR1$; seasonal autocorrelation lag 2, $SAR2$; seasonal autocorrelation lag 3, $SAR3$; $p < .05$, two-tailed.

Table 16. ARIMA 8: Percentage of People Reporting Gunfire Present and Weather Variables (N = 58)

Variables in the Model:

	B	SEB	T-RATIO	APPROX. PROB.
SAR1	.195968	.165152	1.1865898	.24111089
SAR2	.271144	.154717	1.7525240	.08593926
SAR3	.248688	.208086	1.1951224	.23779164
hightem	-.278574	.149958	-1.8576840	.06922823
rain	-5.349449	2.298961	-2.3268988	.02414770
%hearing	.086956	.031230	2.7843542	.00760148
CONSTANT	27.581572	12.412727	2.2220398	.03092951

* Unstandardized coefficients for variables, B and unstandardized coefficients for estimated standard errors, SEB; seasonal autocorrelation lag 1, SAR1; seasonal autocorrelation lag 2, SAR2; seasonal autocorrelation lag 3, SAR3; $p < .05$, two-tailed.

the presence of night gunfire remained statistically significant. In addition, the independent variable, percentage of people reporting the presence of gunfire, seemed relatively insensitive to the autocorrelation structure of night recorded gunfire. For example, analyses computed with an ARIMA (5,1,1)(3,0,0) model were also statistically significant ($p < .05$). The percentage of residents reporting the presence of gunfire appeared to be a robust predictor of the presence of night gunfire.

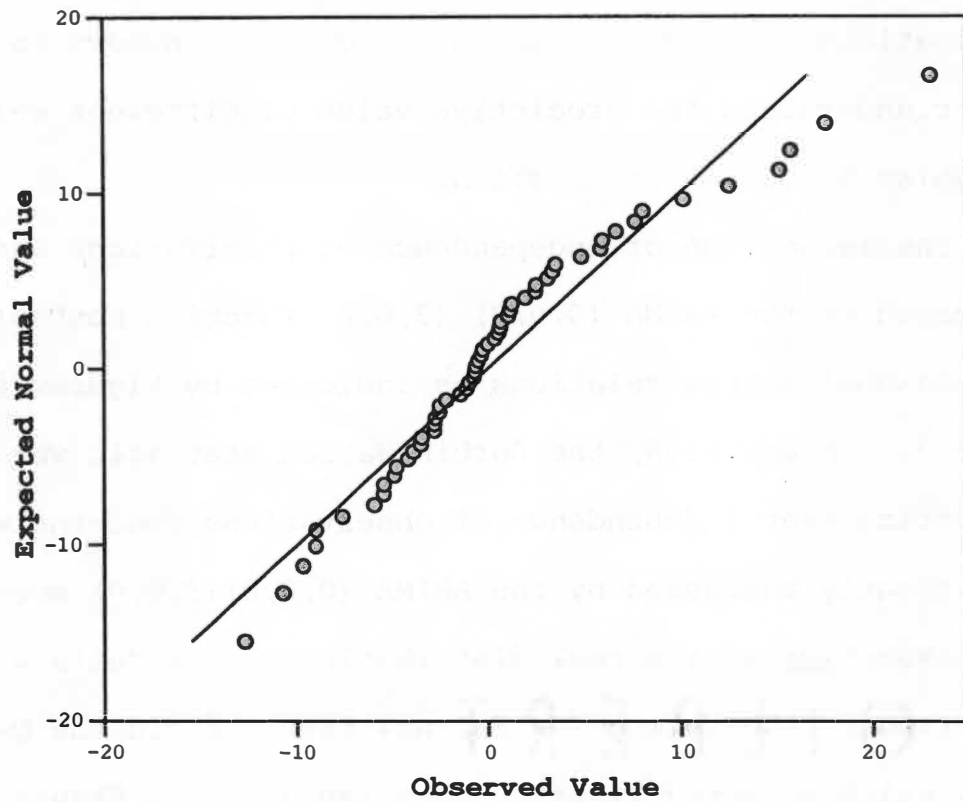
The weather variable, absence of precipitation, again appeared to be a predictor of recorded gunshots ($B = -5.35$, $t = -2.33$, $p < .05$). The variables high and low

temperatures were probably influenced by the time of year data were collected. The 59 nights of data collection occurred during late spring and early summer. Many replications of this and similar studies are needed to better understand the predictive value of different weather variables in different locations

The assumption of independence of observations was addressed by the ARIMA (0,0,0) (3,0,0) function controlling for seasonal autocorrelations as indicated by Figures 6.6 and 6.7. In addition, the Durbin-Watson statistic was 1.9 suggesting that independence of observations concerns were sufficiently addressed by the ARIMA (0,0,0) (3,0,0) model. The assumption of a normal distribution of residuals was supported by the Kolmogorov Smirnov test, as did the Q-Q plot, which appeared linear. (See Table 17 and Figure 6.8). The time sequence plot indicated that the variance of the Y score was relatively uniform for values of X as indicated by Figure 6.9. The assumption of homoscedasticity did not appear to be substantially violated.

To further examine the relationships between the dependent variables, Area B night recorded gunfire, and independent variables, Pearson Correlations and Spearman's

Normal Q-Q Plot of Residuals for Night
Gunshots ARIMA (0,0,0) (3,0,0)



**Figure 6.8 Q-Q Plot of Night Recorded Gunshots ARIMA
(0,0,0) (3,0,0)**

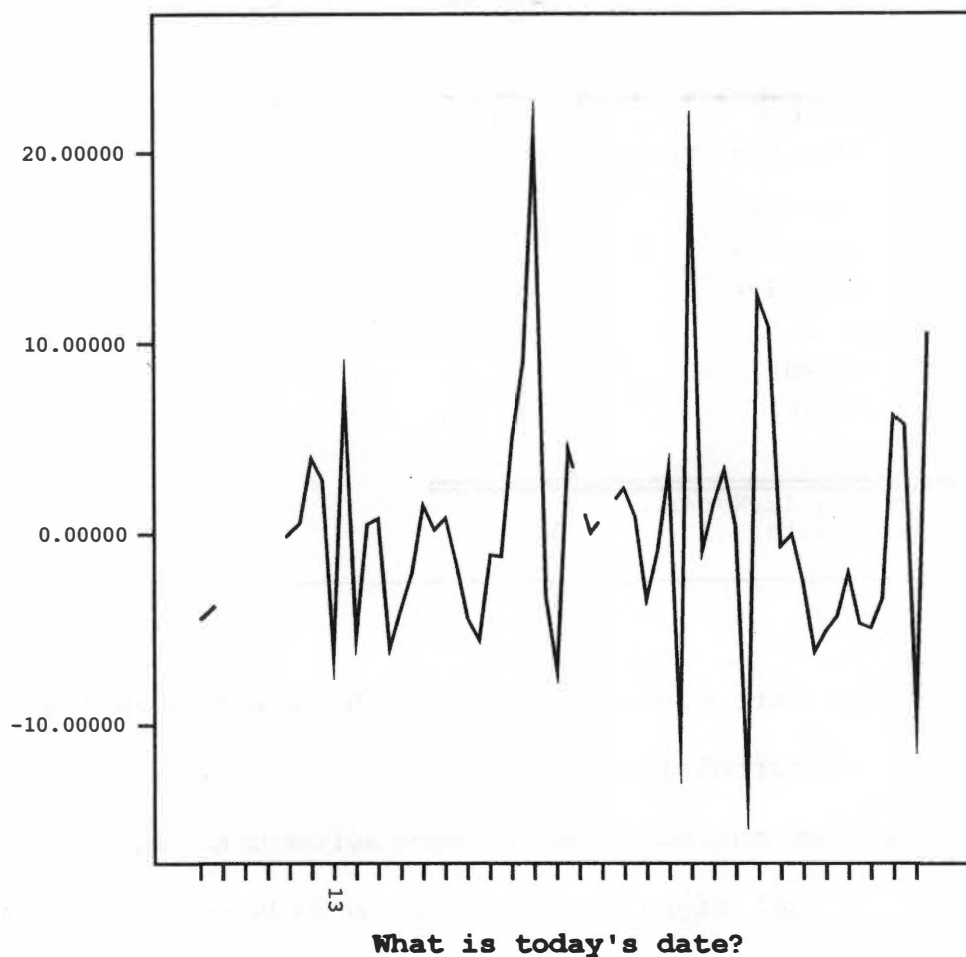


Figure 6.9 Time Sequence Plot for Residuals of Night Recorded Gunfire

Table 17. Kolmogorav-Smirnov Test for Normal Distribution of Night Recorded Gunfire Residuals

		Residuals for Night Recorded Gunfire
Normal	Mean	.6128388
Parameters (a,b)	Std. Deviation	7.0263435
		9
Most Extreme Differences	Absolute	.142
	Positive	.142
	Negative	-.070
Kolmogorov-Smirnov Z		1.066
Asymp. Sig. (2-tailed)		.206
Exact Sig. (2-tailed)		.319
Point Probability		.000

a Test distribution is Normal.

b Calculated from data.

rho Correlations were computed. Since the raw ShotSpotter data used in the correlations contained autocorrelations, only the parameter estimates were considered unbiased. The tests of statistical significance were considered to be seriously affected by the autocorrelation structure of the recorded gunfire data.

As indicated by Table 18, the Pearson Correlation parameter for average number of gunshots recorded and night recorded gunfire was .298. The parameter for the percentage

Table 18. Pearson Correlations between Area B Night Recorded Gunfire and Residents' Reports of Gunshots

		How many gunshots were recorded for the interview night?
How many gunshots were recorded for the interview night?	Pearson Correlation	1
	Sig. (1-tailed)	.
	N	59
What is the average number of shots reported for the day?	Pearson Correlation	.298 (*)
	Sig. (1-tailed)	.012
	N	57
What percentage of residents reported the presence of gunshots?	Pearson Correlation	.349 (*)
	Sig. (1-tailed)	.004
	N	58

* Correlation is significant at the 0.05 level (1-tailed).

of people reporting the presence of gunfire was .349. The tests of statistical significance indicated that both correlations were statistically significant, but the autocorrelation structure of the data made those results questionable.

The Spearman's rho correlation indicated that the parameter for average number of gunshots reported was .172. The Spearman's rho parameter for the percentage of people reporting the presence of gunfire was .207. Neither correlation was considered statistically significant. (See Table 19).

As indicated in Table 20, the Pearson correlation between Area B night-recorded gunfire and weather indicated that the parameter for high temperature was $-.041$ and the parameter for low temperature was $-.058$. The parameter for precipitation was $-.345$ and was considered statistically significant. The Spearman's rho correlation parameter for high temperature was $-.002$ and the parameter for low temperature was $-.107$ (see Table 21). The parameter for precipitation was $-.444$ and was considered statistically significant. Again, all of the correlation tests of

Table 19. Spearman's rho Correlations between Area B Night Recorded Gunfire and Residents' Reports of Gunshots

		How many gunshots were recorded for the interview night?
Spearman's rho	How many gunshots were recorded for the interview night?	Correlation Coefficient 1.000
		Sig. (1- tailed) N 59
	What is the average number of shots reported for the day?	Correlation Coefficient .172
		Sig. (1- tailed) N 57
	What percentage of residents reported the presence of gunshots?	Correlation Coefficient .207
		Sig. (1- tailed) N 58

Table 20. Pearson Correlations between Area B Night Recorded Gunfire and Weather Variables

		How many gunshots were recorded for the interview night?
How many gunshots were recorded for the interview night?	Pearson Correlation	1
	Sig. (2- tailed)	.
	N	59
What is the high temperature for the day?	Pearson Correlation	-.041
	Sig. (2- tailed)	.765
	N	57
What is the low temperature for the day?	Pearson Correlation	-.058
	Sig. (2- tailed)	.667
	N	57
Was precipitation presence during the interview time?	Pearson Correlation	-.345(**)
	Sig. (2- tailed)	.007
	N	59

** Correlation is significant at the 0.01 level (2-tailed).

Table 21. Spearman's rho Correlations between Area B Night Recorded Gunfire and Weather Variables

		How many gunshots were recorded for the interview night?	
Spearman's rho	How many gunshots were recorded for the interview night?	Correlation Coefficient	1.000
		Sig. (2- tailed)	.
		N	59
	What is the high temperature for the day?	Correlation Coefficient	-.002
		Sig. (2- tailed)	.987
		N	57
	What is the low temperature for the day?	Correlation Coefficient	-.107
		Sig. (2- tailed)	.427
		N	57
	Was precipitation presence during the interview time?	Correlation Coefficient	-.444(**)
		Sig. (2- tailed)	.000
		N	59

** Correlation is significant at the 0.01 level (2-tailed).

statistical significance should be regarded with much caution due to the autocorrelation structure of the recorded gunfire data.

Identification of the Early Morning Recorded Gunfire Counts

In order to examine the relationships between residents' reports of gunfire and gunfire recorded during the early morning hours (12:01 a.m. to 5:00 a.m.), a diagnosis of the dependent variable for autocorrelations was needed. The patterns of autocorrelations for the early morning gunfire were very different from the gunshot patterns for night-time and 24 hour time frames. As indicated in Figures 6.10 and 6.11, the autocorrelation and partial autocorrelation functions indicated a lag one autocorrelation. As suggested by the residual analysis, the results of which are shown in Figures 6.12 and 6.13, the autocorrelations could be adequately modeled with an ARIMA (1,0,0)(0,0,0) model. The lag one autocorrelation (AR1) in ARIMA (1,0,0)(0,0,0) was considered statistically significant ($p < .05$). (See Table 22).

How many gunshots were recorded during the very early morning (12:01 a.m. to 5:00 a.m.)?

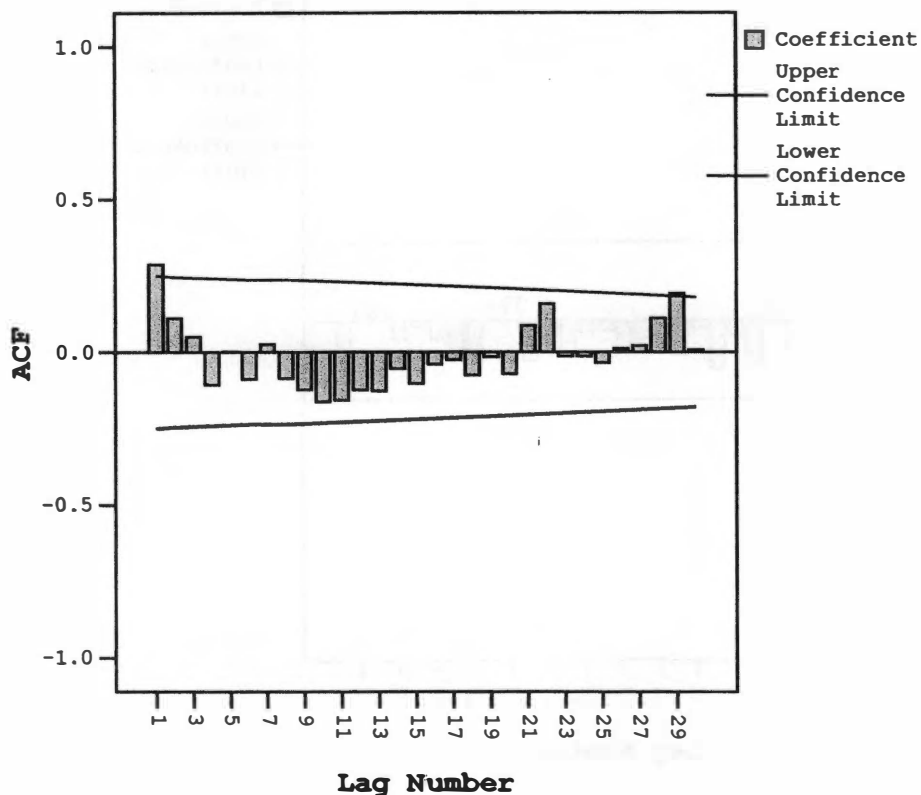


Figure 6.10 Autocorrelations for Early Morning Recorded Gunfire

How many gunshots were recorded during the very early morning (12:01 a.m. to 5:00 a.m.)?

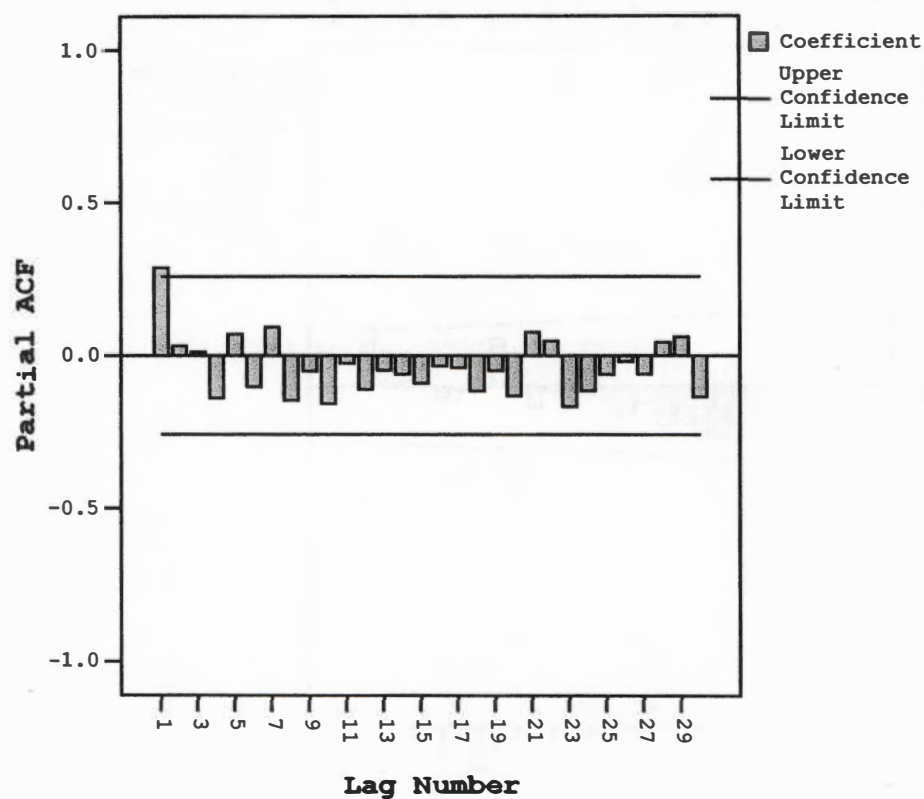


Figure 6.11 Partial Autocorrelations for Early Morning Recorded Gunfire

**Residuals for Early Morning Gunshots ARIMA
(1,0,0) (0,0,0)**

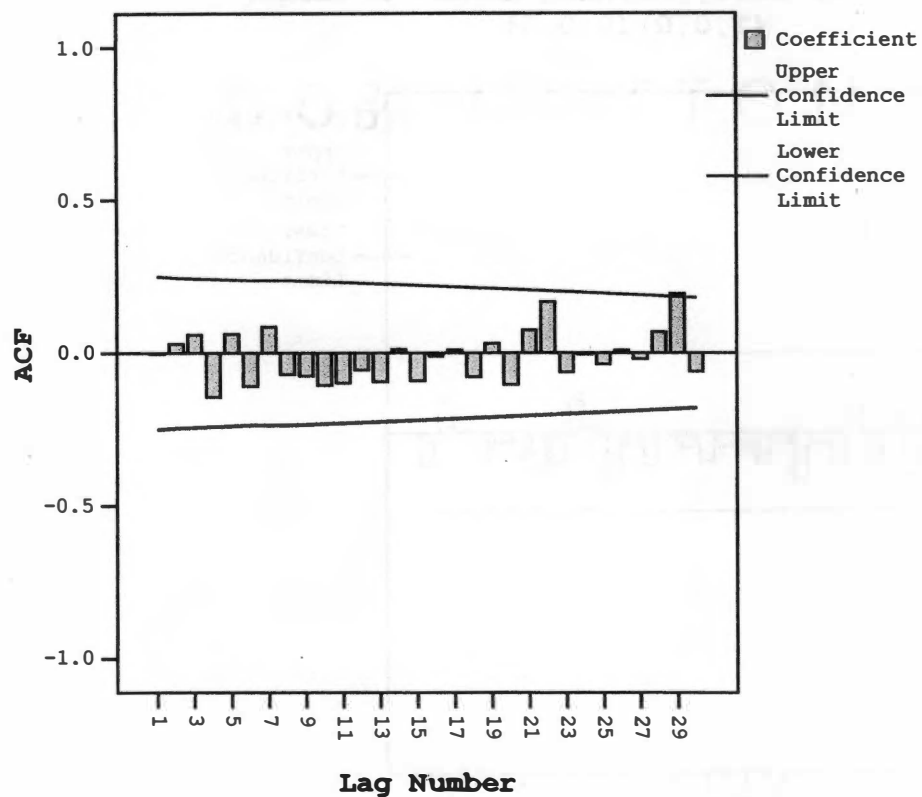
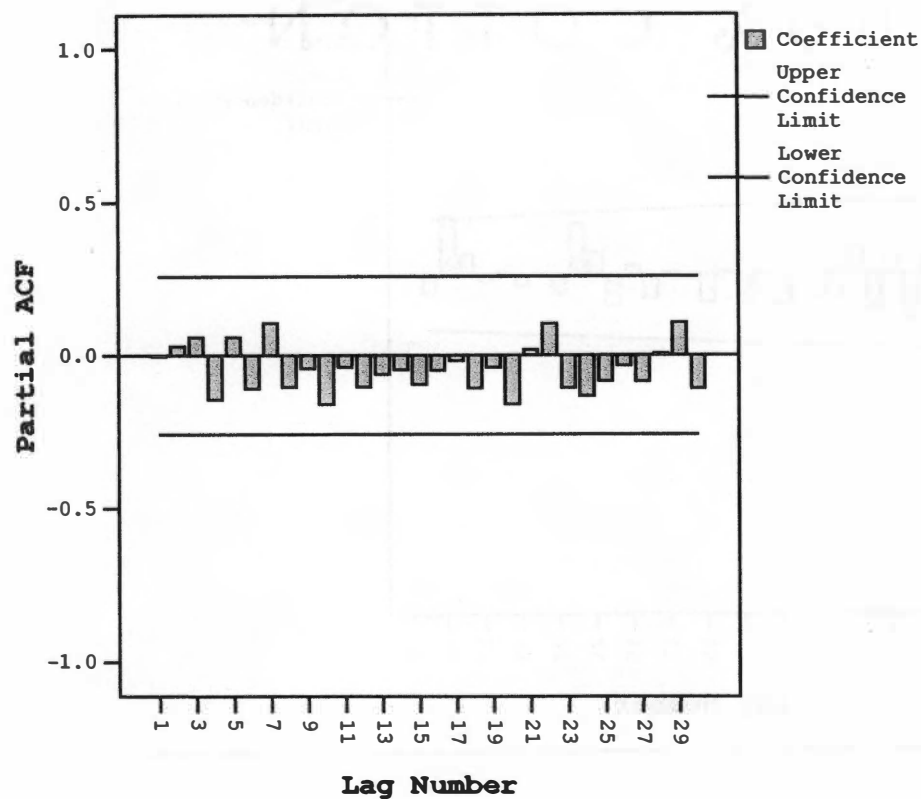


Figure 6.12 Autocorrelations for Early Morning Recorded Gunfire ARIMA (1,0,0) (0,0,0) Model

**Residuals for Early Morning Gunshots ARIMA
(1,0,0) (0,0,0)**



**Figure 6.13 Partial Autocorrelations for Early Morning
Recorded Gunfire ARIMA (1,0,0) (0,0,0) Model**

**Table 22. ARIMA Model for Morning Gunshots (1,0,0) (0,0,0)
(N = 60)**

Model Description:

Variable: gunshots recorded during early morning (12:01 a.m. to 5:00 a.m.)

No seasonal component in model.

Variables in the Model:

	B	SEB	T-RATIO	APPROX. PROB.
AR1	.2827292	.1259522	2.2447342	.02861422
CONSTANT	5.6382562	1.6857987	3.3445607	.00144914

Unstandardized coefficients for variables, B and unstandardized coefficients for estimated standard errors, SEB; autocorrelation lag 1, (AR1); $p < .05$, two-tailed.

Gunfire Between 12:01 a.m. and 5:00 a.m.

During the data collection time frame, ShotSpotter recordings indicated that 45.20% of the total recorded gunshots occurred between 12:01 a.m. and 5:00 a.m. ($\bar{M} = 3, 18, \underline{SD} = 7.73$). It was predicted that the validity of people's reports might be affected by the time of day gunshots were recorded. To further examine the relationship between residents' responses about early morning gunfire and recorded counts of gunfire, the following analyses were conducted. The dependent variable was the total recorded

gunshots occurring between 12:01 a.m. and 5:00 a.m. The independent variables were residents' reports about gunfire in the last 24 hours. With the ARIMA function controlling for autocorrelations, the following ARIMA analyses were conducted:

ARIMA 10. DV: Area B early morning gunfire recordings
 IV: Average number of gunshots reported by
 residents;

ARIMA 11. DV: Area B early morning gunfire recordings
 IV: Percentage of residents reporting the
 presence of gunfire;

ARIMA 12. DV: Area B early morning gunfire recordings
 IV: High temperature
 IV: Low temperature
 IV: Precipitation-

As indicated in Tables 23 and 24, residents' reports were not statistically significant predictors of early morning gunshots. When controlling for autocorrelations, gunshot numbers reported by residents were not valid predictors of morning gunfire (i.e. $B = -.06$, $t = -.043$, $p > .05$, one-tailed). When controlling for autocorrelations, the percentage of people reporting the presence of gunfire,

Table 23. ARIMA 10: Early Morning (N =59)

Variables in the Model:

Dependent variable: gunshots recorded during early morning (12:01 a.m. to 5:00 a.m.)

	B	SEB	T-RATIO	APPROX. PROB.
AR1	.2684780	.1301376	2.0630319	.04384320
avereport	-.0591287	1.3837685	-.0427302	.96607139
CONSTANT	5.8243703	1.9153482	3.0408937	.00360894

Unstandardized coefficients for variables, B and unstandardized coefficients for estimated standard errors, SEB; autocorrelation lag 1, (AR1); $p < .05$, one-tailed.

Table 24. ARIMA 11: Early Morning (N =59)

Variables in the Model:

Dependent variable: gunshots recorded during early morning (12:01 a.m. to 5:00 a.m.)

Variables in the Model:

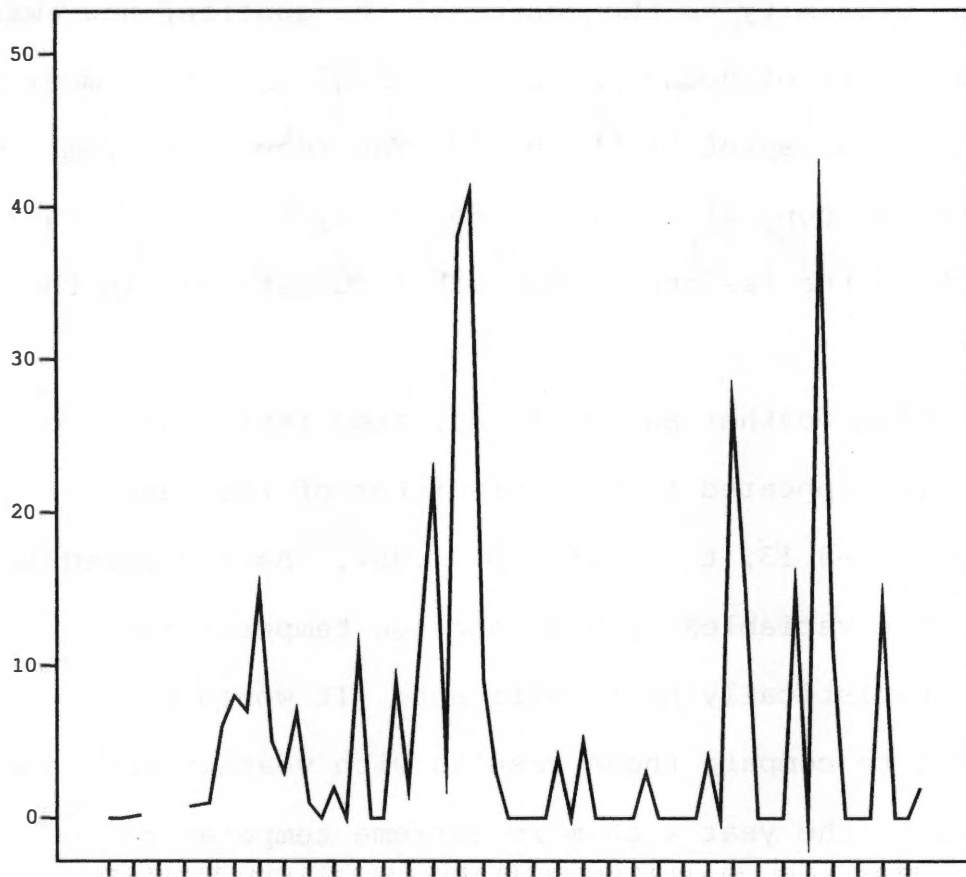
	B	SEB	T-RATIO	APPROX. PROB.
AR1	.2782662	.1287612	2.1611029	.03497896
percent	.0000542	.0402128	.0013467	.99893030
CONSTANT	5.7320869	2.2946022	2.4980744	.01545011

Unstandardized coefficients for variables, B and unstandardized coefficients for estimated standard errors, SEB; autocorrelation lag 1, (AR1); $p < .05$, one-tailed.

did not appear to be a valid predictor of the presence of early morning recorded gunshots (i.e. $B = .0001$, $t = .001$, $p > .05$, one-tailed). Neither residents' reports of the number of gunshots or the percentages of persons reporting the presence of gunfire were valid indicators of early morning gunfire recordings.

Perhaps the lack of validity for residents identifying the presence of gunfire in early morning was due to traditional sleep patterns. Most people were perhaps sleeping between 12:01 a.m. and 5:00 a.m. As indicated by Figure 6.14, gunfire appeared to be a problem for some early morning time frames. Perhaps questions indicating the presence of early morning gunfire should include references to patterns of sleep and gunshot disturbances of sleep. As a general question, 96.7% of the respondents did indicate that gunfire had bothered their sleep. The relationships of these sleep disturbances to early morning gunshots were not addressed in this study.

The direction of this study was to evaluate the validity of residents' gunfire reports when compared with gunfire recordings for a particular day. Other factors that perhaps impacted the validity of responses included the



What is today's date?

Figure 6.14 Early Morning Recorded Gunshots

residents' proximity to the source of the gunfire, how aware individuals were of sounds while sleeping, and the number of hours individual spent in the home. The responses from some subsets of the population of residents may have had greater validity than the responses from other subsets within the population.

The ARIMA weather analysis indicated that absence of precipitation appeared to be a predictor of recorded gunshots ($B = -8.13$, $t = -2.43$, $p < .05$). As indicated in Table 25, the variables of high and low temperatures appeared statistically nonsignificant. It would be interesting to compare those results with weather analyses from times of the year with more extreme temperature readings. The high temperature for the data collection time frame had a mean of 81.9, median of 82, and mode of 82. The low temperatures had a mean of 62.97, median of 64, and mode of 67.

Table 25. ARIMA 12: Early Morning Gunfire and Weather (N =58)

Variables in the Model:

	B	SEB	T-RATIO	APPROX. PROB.
AR1	.271193	.133784	2.0270955	.04769553
lowtemp	.350161	.309648	1.1308377	.26321475
hightemp	.022456	.332261	.0675848	.94637047
rain	-8.128694	3.344683	-2.4303330	.01850331
CONSTANT	-15.663577	19.581402	-.7999211	.42732737

Emergency Calls for Help

Emergency calls to the Emergency Management Center for gun related concerns and assaults totaled 57 calls. The calls for gun related concerns followed a very clear pattern: they occurred only when a person was shot or in danger of being shot, or when personal property was being damaged. There were no calls for hearing gunfire in the distance. In addition, calls were not made to report someone randomly shooting into the sky. There were calls from locations outside of Area A and Area B about hearing random gunfire. Those locations did not appear to have a history of moderate gunfire activity.

There were 13 calls reporting that someone had been shot or was being shot at, or that personal property was being damaged by someone's shooting. The information available to the public from emergency calls was very limited. Details regarding what happened at the locations reporting gunfire were not available. The hypotheses were made that 911 calls about gunfire would correlate to individual reports of gunfire and to recorded counts of gunfire. As indicated in Table 26, the results from two-tailed Pearson and Spearman's rho correlation analyses

Table 26. Relationship of Recorded Gunfire and 911 Calls for Gunfire (Two-tailed)

Pearson Correlation	How many gunshots were recorded for the interview night?
For this day, how many 911 calls for gunshots were received?	-.154
Sig. (2-tailed)	.245
N	59

Spearman's rho	How many gunshots were recorded for the interview night?
For this day, how many 911 calls for gunshots were received?	-.196
Sig. (2-tailed)	.137
N	59

indicated no statistically significant relationship between 911 calls regarding gunfire and recorded gunfire. Again, correlations were only computed for Area B due to the lack of variability in Area A.

Another hypothesis of the study was that residents' reports of gunfire would have a higher correlation with gunfire than with 911 gunfire calls. As indicated in Table 27, resident reports appeared to have a statistically significant Pearson correlation with recorded gunfire ($p < .05$), but not with 911 gunfire calls ($p > .05$). Neither residents' reports nor 911 gunfire calls had a statistically significant Spearman's rho correlation ($p < .05$). Due to the autocorrelations in the recorded gunfire data, tests of significance could be seriously biased. The possibility of Type I errors increased with positive autocorrelations and the possibility of Type II errors increased with negative autocorrelations. Pearson correlation parameters for variables were 911 gunfire calls, $-.154$; percentage of residents reporting the presence of gunfire, $.349$; and number of gunshots reported, $.298$. As indicated in Table 28, the Spearman's rho parameters for variables were as follows: 911 gunfire calls, $-.196$; percentage of residents

Table 27. Pearson Correlations between Residents' Reports, 911 Calls for Gunfire, and Recorded Gunfire (N = 59)

		What is the average number of shots reported for the day?	What percentage of residents reported the presence of gunfire?	How many gunshots were recorded for the interview night?	For this day, how many 911 calls for gunshots were received?
What is the average number of shots reported for the day?	Pearson Correlation	1	.665(*)	.298(*)	.008
	Sig. (2-tailed)	.	.000	.025	.950
What percentage of residents reported the presence of gunfire?	Pearson Correlation	.665(*)	1	.349(*)	-.083
	Sig. (2-tailed)	.000	.	.007	.516
	Pearson Correlation	.298(*)	.349(*)	1	-.154
	Sig. (2-tailed)	.025	.007	.	.245
For this day, how many 911 calls for gunshots were received?	Pearson Correlation	.008	-.083	-.154	1
	Sig. (2-tailed)	.950	.516	.245	.

* Correlation is significant at the 0.05 level (2-tailed).

Table 28. Spearman's rho Correlations between Residents' Reports, 911 Calls for Gunfire, and Recorded Gunfire (N = 59)

		What is the average number of shots reported for the day?	What percentage of residents reported the presence of gunfire?	How many gunshots were recorded for the interview night?	For this day, how many 911 calls for gunshots were received?
What is the average number of shots reported for the day?	Correlation Coefficient	1.000	.770 (*)	.172	.025
	Sig. (2-tailed)	.	.000	.201	.845
What percentage of residents reported the presence of gunfire?	Correlation Coefficient	.770 (*)	1.000	.207	-.030
	Sig. (2-tailed)	.000	.	.119	.817
How many gunshots were recorded for the interview night?	Correlation Coefficient	.172	.207	1.000	-.196
	Sig. (2-tailed)	.201	.119	.	.137
For this day, how many 911 calls for gunshots were received?	Correlation Coefficient	.025	-.030	-.196	1.000
	Sig. (2-tailed)	.845	.817	.137	.

• Correlation is significant at the 0.05 level (2-tailed).

reporting the presence of gunfire, .207; and number of gunshots reported, .172.

From areas A and B, there were 44 calls reporting assault. The hypothesis that residents' reports of gunfire were correlated to reported assaults was not supported. A thought was that a willingness to report gunfire to an interviewer might be correlated with calling for emergency help when someone was assaulted. This hypothesis was not supported as shown by Tables 29 and 30. The results from the Pearson and Spearman's rho correlations procedures ($p > .05$) were not statistically significant.

Summary of Results

The results of this study indicate that the percentage of residents reporting the presence of gunfire was a valid predictor of night gunfire. The greater the percentage of people reporting gunfire, the greater the number of night gunshots recorded by ShotSpotter. Residents' reports of the actual number of gunshots were not valid. Residents also identified certain patterns of gunfire in their neighborhood. Gunfire was more apt to occur at night and on Saturday.

Table 29. Pearson Correlations between Residents' Gunfire Reports and 911 Assault Calls

		How many 911 calls for assault were received?
How many 911 calls for assault were received?	Pearson Correlation	1
	Sig. (2-tailed)	.
	N	64
What is the average number of shots reported for the day?	Pearson Correlation	-.032
	Sig. (2-tailed)	.807
	N	62
What percentage of residents reported the presence of gunfire?	Pearson Correlation	.017
	Sig. (2-tailed)	.892

Table 30. Spearman's rho Correlations between Residents' Gunfire Reports and 911 Assault Calls

			How many 911 calls for assault were received?
Spearman's rho	How many 911 calls for assault were received?	Correlation Coefficient	1.000
		Sig. (2-tailed)	.
		N	64
	What is the average number of shots reported for the day?	Correlation Coefficient	-.006
		Sig. (2-tailed)	.961
		N	62
	What percentage of residents reported the presence of gunfire?	Correlation Coefficient	.015
		Sig. (2-tailed)	.907
		N	63

As indicated by the limited publicly available 911 information, calls for help were related to a person being shot, in danger of being shot, or personal property being damaged. Calls were not made for random gunfire such as when someone fired a rapid succession of shots into the air.

CHAPTER VI

Discussion and Implications

This chapter discusses the hypotheses of this study, limitations of the study, and implications for future research, policy, and practice.

Research Hypotheses

The first hypothesis of this study was that a positive relationship existed between recorded counts of gunfire and individuals' reports of gunfire. The hypothesis was supported in the following ways. The relationship between residents' reports of the presence of gunfire and ShotSpotter counts of night gunfire was statistically significant. The percentage of people reporting the presence of gunfire was a valid indicator of recorded night gunshots. In addition, data from interviews and ShotSpotter indicated that Saturday was the day of the week with the highest level of gunfire. Both data sources also identified night as the time of day when gunfire was more likely.

The residents' reports of the actual number of gunshots in the previous 24 hours were not valid. Previous gunshot

recordings and lack of precipitation were indicators of the actual number of shots.

The second hypothesis was that a relationship existed between recorded counts of gunfire and 911 calls about gunfire. This hypothesis was not supported. Emergency calls indicated that someone was shot, or in danger of being shot, or that personal property was being damaged. It appeared that people did not call in response to random gunfire. Calls were related to personal hurt or damage. What appeared to be a reluctance to report gunfire was consistent with the findings by Travis (1996) that people often do not report violence out of fear of retaliation.

The third hypothesis predicted that individual reports of gunfire would have a higher correlation with recorded gunfire than with 911 gunshot calls. This hypothesis was supported. Residents' reports of the presence of gunfire were a valid indicator of the presence of recorded gunfire. The correlation between recorded gunshots and 911 calls was not statistically significant.

The fourth hypothesis predicted that a relationship would exist between individuals' reports of gunfire and reported assaults (two-tailed). The thought was that

reporting actual harm to someone would be related to reporting gunfire. This was not supported. Perhaps part of the reason for this was that most of the gunfire appeared to be rapid successions of random gunfire with no apparent target, whereas assaults usually had an identified target.

Limitations of This Study

As indicated earlier, this was a beginning study of the validity of people's reports of gunfire and recorded gunfire. The external validity of this study is low. Many replications of this and similar studies are needed for more conclusive results. The main internal threat to the validity of this study involved interrater reliability.

Interrater Reliability of Data Collectors

At various times this study had four different interviewers. The interviewers were trained regarding concerns for confidentiality, protection of respondents, and use of the instrument. The first attempt at finding interviewers was to have retired people conduct the interviews. This had much potential, but the referral source primarily identified people that were having

significant health problems and hospitalizations. The second attempt was to find stay-at-home parents. One interviewer was not able to continue due to a fall and surgeries. Another had a change in personal circumstances that precluded this work. A problem was that most people wanted to conduct interviews occasionally rather than every day. A young adult working part-time seemed to do the best job of fitting the interviews into her schedule. Her mother also agreed to work as her substitute if absolutely needed. That interrater reliability was not computed and formally reported was a limitation of this study. At the beginning of following studies, planning for interrater reliability and locating a larger number of potential interviewers would be important.

Similarly, interrater reliability was needed in evaluating the ShotSpotter data. A ShotSpotter consultant listened to some recordings to verify that the sounds recorded were gunshots. There appeared to be agreement among evaluators, but this was not computed and formally reported. No one listened to additional recordings and no assessment of interrater reliability was conducted. Recordings of distant shots were the most difficult to

identify. For day and evening hours, several possible shots were excluded because of the possibility that they might be sounds related to construction work.

In addition, having someone check to verify that the sounds were actually gunfire was not done. With the actual ShotSpotter system, a person checks to verify the presence of gunfire. That should only be done with a meticulously designed safety protocol and by trained responders working with the police department. That would also include the need for an interdisciplinary approach. That was not the nature of this study.

Placement of Sensors

As mentioned above, a concern was the placement of the sensor. Because of the level of break-ins in parts of the area, safety of equipment was a major issue. If the equipment had been stolen, there would have been no recordings. The preferred location for the sensor would have been buildings closer to the gunfire. A problem was that those buildings had a higher level of stolen property. Equipment needs to be located on buildings considered best for recordings purposes. Perhaps the best options for

placement of sensors will occur when the sensors become wireless. In this study, concern for safety of the equipment superceded locating the sensor in the best location for data collection.

A second reliability concern was also related to the placement of sensors. At least one additional sensor was needed to verify the presence of a gunshot recording. Preferably, the sensor would be on a different building in the same area. This would increase the accuracy of determining whether a recording was an electrical glitch or a gunshot recording. The impact of unreliable data reduces both the statistical conclusion validity and construct validity of this study.

Lack of Precipitation Data

One problem with data regarding the amount of precipitation was a lack of information. The closest National Weather Service had hourly measurements of precipitation, but that weather station received substantially more rain than the target sites. The weather station had a greater amount of rain as well as more frequent occurrences of rain. An example was that over one

inch was measured at that weather station, but only a trace was measured at the sensor site. A closer weather station with less equipment had precipitation totals that were more similar to total rain accumulation at the sites. The problem was that the close weather site only recorded total amounts for 24 hour time frames. They did, however, give a narrative of when precipitation occurred such as midday or night.

An interview day was defined as 24 hours prior to the interview. This included time frames from two different days. Therefore, the precipitation variable in this study only indicated the presence of precipitation during the interview time. For future research purposes, a measure that records hourly precipitation would allow for an interval level variable. In this study, exact measurements of precipitation during the interview time frame were not available.

Missing Data

In computing the ARIMA model for the dependent variable, recorded gunfire, seven sequential days of data were missing. This missing data were addressed by extending

the data collection time frame by seven days. A possibility for dealing with the missing data would have been to have a mean substitution for each day of the week, but a larger concern was having 12% of the dependent variable missing from area B. The impact of having the missing week of gunfire recordings on the ARIMA model is not known. The external validity was reduced.

The remaining missing data for the independent variables used in the analyses were less than 5%. The method for dealing with that missing data was to use the SPSS listwise procedure. The exception was one independent variable that was deleted. It appeared that the question for that variable was poorly designed. People were asked how many hours they were in their home or neighborhood the previous day. The question was not clear, and people were not sure how to answer. In addition, the missing data for that question was 19.3%.

Sampling Issues

The source for phone numbers in this study was the current City Directory for the identified location. People without telephones were not included in the sample.

Although a spokesperson for the City Directory stated that cell phone numbers were included in the directory, the inclusion of cell phone numbers was not evident. In addition, the directory included less than ten phone numbers for people living in public housing. Also, of the people interviewed, 97.9% had lived in their homes over three years. In addition, in each of the homes where interviews were conducted, an adult had previously interviewed with an employee of the City Directory. A concern is that a systematic bias may have existed among the people interviewed. The people interviewed represented a sample of convenience and may not be representative of the population. Thus, the statistical conclusion validity of the study is impacted and results should be viewed with caution.

Another concern is the 19.14% refusal rate among people contacted for interviews. No attempt was made to interview those people in person. If the people who refused to answer the questions had very different viewpoints, their viewpoints were not indicated in the study. Again, the statistical conclusion validity is impacted by this lack of information.

Implications for Research

As mentioned, no comprehensive measure of community violence exists. Basic to the process of developing a comprehensive measure of community violence is the need to establish the validity of indicators of community violence. According to Guterman, Cameron, and Staller, in the study of community violence, "the existing knowledge base presents a collection of groundbreaking studies that have documented the extent and the profound impact of community violence in young person's lives. However, taken as a whole, the empirical work conducted in this area suffers from a lack of consensus or even explicit discussion regarding the parameters of 'community violence' as an important phenomenon of study" (2000, p.580). The authors further assert the need to clarify the boundaries and perceptive elements involved in "violence" exposure and a need for specificity in clearly demarcating the parameters of community violence exposure.

The most frequently quoted measure of community violence is the Uniform Crime Report which, according to the

National Crime Victimization Survey, underestimates violent crime by 81% (2001). The NCVS has a more detailed reporting of violent crimes, but it takes two years to complete. More current measurements are needed.

Before beginning this study, several researchers in the field of community violence were contacted. Agreement was expressed that an indicator that gave immediate feedback on the presence of gunfire would be extremely valuable. Since that time the ShotSpotter instrument was developed for identification of the actual frequency of gunshots.

ShotSpotter appears to be a measure of community violence that gives immediate feedback on the presence and frequency of gunshots. This study provides the basis for a simple, current need assessment that identifies the current presence of night gunfire in a neighborhood.

A simple need assessment that identifies whether night gunfire is present gives researchers a tool for assessing the current presence of gunfire. Data collection of residents' reports would probably be needed for at least a month due to cycles of gunfire activity. Levels of periodicity from different locations would vary. Generalizing the presence of gunfire from one location to

another would be inappropriate. Again, the percentage of people reporting the presence of gunfire appears to be valid only for the hours between 5:01 p.m. and 12:00 a.m.

A second implication of this study is a need to further study the impact of gunfire on people's sleep. Mitru, Millrood, and Mateika indicate that sleep deprivation reduces cognitive efficiency and results in decreased academic performance and increased behavioral problems (2002). With 96.7% of the adults (N = 331) responding that gunfire had bothered their sleep, more research is needed in this area. The impact of gunshots on the sleep patterns of children and adults has not been researched. This would be most important to children and adults living in close proximity to areas with frequent gunshots.

There is also a need for further research on gunfire patterns. Opportunities may exist for further exploring the specific patterns of gunfire such as during the time frame between 2:00 a.m. and 4:00 a.m.; on a particular day of the week; with a certain range of atmospheric temperatures and precipitation; and with certain patterns of autocorrelations and seasonal autocorrelations. Undoubtedly there will always be unusual occurrences of gunfire that are totally

unexpected and unusual for the location, but some random gunfire patterns could perhaps be better understood.

Implications for Policy

A problem in some communities with gunfire is that policy is apt to be tailored entirely by people who do not live in the designated neighborhoods. If the perception is that people are sensationalizing the gunfire problem or that the problem has already been solved, concerns will be less apt to be addressed. Having a simple instrument that is a valid indicator of the presence of night gunfire has the potential for increasing the awareness of policy makers. With community safety of children and their families being an important responsibility of the community, this study provides a tool for increasing awareness.

Implications for Practice

The implications of this study for practitioners include an increased awareness of the problems facing their clients. A common occurrence for most practitioners is working with children that have behavior problems. An example of using awareness of community gunfire presence was

demonstrated by one kindergarten teacher. The teacher was aware that a particular child lived in a very chaotic neighborhood with frequent night gunfire. Rather than pushing a very tired child to concentrate and work, the teacher first allowed the child to nap. The result was a more rested child who progressed academically and was well behaved. Rather than considering this teacher's approach as a lowering of standards, the teacher used a simple strategy that resulted in more effective programming. Having an increased awareness of the reality of this child's life, resulted in the selection of a strategy that was beneficial to the child. Following traditional strategies of insisting that the child concentrate and behave had previously resulted in behavior problems and a frustrating day for the child and teacher.

For many children receiving special education services, an individualized plan is devised to meet their academic needs. Perhaps, for some children, the need for sleep is as great as the need for lunch. For children living close to night gunfire, this is a possible consideration. Also, as indicated by the periodicity of the gunfire recordings, additional rest may only be needed occasionally.

Undoubtedly, other children also have home and community environments that preclude getting enough rest. Mitru, Millrood, and Mateika suggest a need for some children experiencing sleep deprivation to have delayed academic schedules. The question is how can the child's program be tailored to assist the young person in developing his/her potential? It is interesting to note that one summer day camp in the targeted area included a nap time for the elementary and middle school age children. This program appeared to have few behavior problems.

The implications of this study for programmers attempting to reduce the levels of gunfire include (1) access to a tool indicating whether night gunshots are present, and (2) better use of resources to address the problem. For programs attempting to reduce the presence of night gunfire, a current indicator allows practitioners to regularly evaluate whether night gunfire is present. This could result in a more effective use of resources.

Concluding Statement

The responsibility for meeting the safety and academic needs of children is important work. It is also a huge

responsibility. The failures of institutions to meet those needs have serious consequences for both the community and the children. Pretending gunfire does not exist is a highly costly choice that effects children and their neighborhoods. Awareness of the presence of gunfire provides for an opportunity to design programs that realistically fit the needs of more children.

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APPENDICES

A. STUDY 1

FOUR-ARMED STAR

APPENDIX A

QUESTIONNAIRE

Questionnaire

Appendix A

If this is not a convenient time, try to make an appointment to call again-

For any of the following questions, if the person says they do not know, ask them to give their best estimate or guess.

1. Do you ever hear gunshots in your neighborhood?
Yes _____ No _____
2. Thinking back over the last week, which time of day had more gunshots?

Day (5:01 a.m. to 5:00 p.m.)

Night (5:01 p.m. to 5:00 a.m.)

Same
3. To the best of your knowledge which day of the week had the most gunshots in the last 7 days?

Monday _____ Saturday _____
Tuesday _____ Sunday _____
Wednesday _____
Thursday _____
Friday _____
4. Has gunfire ever bothered your sleeping?
Yes _____ No _____
5. It is now _____ o'clock. Over the last 24 hours, about how many gunshots did you hear in your neighborhood? _____
6. About how many hours were you in your home or neighborhood yesterday? _____

7. How long have you lived in your present home?

less than one year_____

one to three years_____

three years or more_____

8. Do you have any questions?

If you have questions about your rights as a participant, contact the Compliance Section of The Office of Research at (865) 974-3466.

If you have any additional questions contact Sylvia Sergeant at (865) 237-7564.

Thank-you for your help.

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APPENDIX B

APPENDIX B

Informed Consent Statement

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INFORMED CONSENT STATEMENT

Appendix B

A Criterion Validity Study of Individuals' Reports of Gunfire and Recorded Gunfire

INTRODUCTION

Hello, my name is (Data Collector's Name). I'm helping with a study being conducted by the College of Social Work at the University of Tennessee. Is this a convenient time to call? The purpose of this study is to better understand about gunshots in neighborhoods. The interview takes about 3-4 minutes. The questions are about gunshots in your neighborhood. All information will be kept confidential and no names will be recorded. No one will be able to identify who answers questions. The interview is voluntary, and will not affect any services you or your family receives. Also you may decide to quit the interview at any time with no penalties.

Do you have any questions?

Do you understand what the study is about?

If the person understands what the study is about, go to the next section.

INFORMATION ABOUT PARTICIPANTS' INVOLVEMENT IN THE STUDY

You will be asked to answer seven questions about gunshots and your neighborhood. If you decide to take part in this study, you may change your mind at any time and quit the interview. Also if you feel stress answering questions about gunfire, please do not answer the questions. The study is to increase understanding about gunfire, not to increase anyone's discomfort.

RISKS

There is a small risk that answering questions about gunfire may cause stress. To protect you, please do not answer any questions that make you feel stressed. Also, I have the phone numbers of two counseling centers in case you feel the need to talk with someone. The telephone numbers are 539-2409 and 521-6336.

BENEFITS

The benefit of this study is to gain a better understanding of gunfire in neighborhoods.

CONFIDENTIALITY

The information in this study will be kept confidential. Immediately after this phone call your address and phone number will be shredded. Answers to questions will be kept in a locked filing case available only to people doing the research, and there will be no way to link your name with what you tell me. After the study is completed the questionnaires will be kept on the U.T. campus in a secure location for three years. No reference will be made in oral or written reports which could link any participant to this study.

CONTACT INFORMATION

If you have questions at any time about the study or would like to talk more about this subject, you may contact Sylvia Sergeant, at 865-237-7564. If you have questions about your rights as a participant, contact the Compliance Section of The University of Tennessee Office of Research at (865) 974-3466.

PARTICIPATION

Your participation in this study is voluntary. You may decide not to participate or to quit at any time without any consequences.

Are you willing to voluntarily participate in this study?

If no, thank the person for their time. Shred the address and phone number.

If yes, continue with the questionnaire.

VITA

Sylvia J. Sergent, L.C.S.W. was born in Lee County, Virginia on September 26, 1953. She graduated from The University of Tennessee with degrees in elementary education and special education. She earned a Master's of Social work at The University of Tennessee in 1977.

Her professional career has included 17 years working as a school social worker in Bay City, Michigan and Knox County, Tennessee. Sylvia's experiences include working with children exhibiting behavior problems, counseling with families, consulting with teachers and administrators, and providing assistance to children reentering public schools from institutions. For seven years, she provided crisis intervention services for Knox County Schools. She has taught classes in school social work and mediation.

Working in schools provided her with summers to pursue additional training and coursework at The University of Denver, The Menninger Clinic, Central

Michigan University, and The University of Michigan. She also had the opportunity to work in a Children's International Summer Village in England and with Operation Crossroads in West Africa. In addition, she worked as a counselor and director of an inner city summer program.

She plans to continue to research on community problems that impact the health and academic development of children.