THE IMPACT OF POLICE AGENCY SIZE ON CRIME CLEARANCE RATES

by

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ABSTRACT

WILLIAM GREGORY KENNEDY. The impact of police agency size on crime clearance rates. (Under the direction of DR. DAVID SWINDELL)

The impact of police agency size on the ability of those agencies to deliver necessary police services is a question critical to many policy makers as they attempt to determine the best and most efficient manner to provide police services to their citizens. Over the years, there has been an ongoing debate as to the role of agency size and its effect on agency effectiveness. This study examines one element of that debate by looking at the role agency size plays on the ability of the agency to clear reported crime.

The study hypothesizes that larger agencies are able to clear a larger proportion of reported crimes because larger agencies can take advantage of larger staff, greater resources and capitalize on other factors often associated with larger organizations. To conduct this analysis, the study develops a data set from LEMAS, UCR, and Census Bureau data that contains 2,271 local, county, and regional police and sheriffs' agencies. Utilizing this data set, the study uses hierarchical regression to assess the impact of agency size on the clearance rates for seven UCR Part I crimes. The analysis controls for the effect of community demographics, agency structure, community policing tactics, and workload.

The results of the analysis are mixed. For several crime categories, agency size dose not contribute significantly. However, for robbery, felony assault and vehicle theft, size is significant and has an inverse relationship to

crime clearance rates. The finding that the clearance rates for robbery, felony assault and vehicle theft would decrease as agency size increases, is contrary to the study's hypothesis. The study concludes with a discussion of possible reasons the size variable did not have the affect theorized, the implications of these findings, a discussion of the issues surrounding the effect of the control variables, as well as possible directions for future research.

DEDICATION

This dissertation is dedicated to my parents, Greg and Leone Kennedy. For nearly fifty years, they have inspired and motivated me to do my best in my academic and professional career, as well as in life. I am grateful for their love and support and this dissertation is a testament to their efforts.

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CHAPTER 1: INTRODUCTION

Does the size of a police agency have an effect on its ability to fulfill its mission? Are larger police forces better suited to meet community needs, or do smaller forces have the advantage? If size matters, should communities create their own policing agencies or should they contract or otherwise obtain police services from larger (regional) police forces? These questions continue to be ongoing issues for both researchers and administrators. A central question in many of these debates is what effect, if any, does agency size have on its ability to provide services? This is an admittedly large and complex subject; however, addressing the main element is feasible and can significantly contribute to the debate. This dissertation examines the relationship between the size of a police agency size and its ability to solve or clear criminal cases. Using Uniform Crime Report (UCR) data, the dissertation investigates and measures the relationship between the size of a police agency and its ability to clear reported crimes. The findings will be of value to administrators and policy makers as they decide issues related to policing in their communities.

Problem Statement

The question of whether a police agency's size influences its ability to fulfill its mission is of growing importance. For many communities, especially those experiencing growth in geographic size and population, the issue of how best to supply police services is not new. For many small town community leaders, the

challenge they face is whether their community should seek out and pay for police services (from a larger regional or county agency) on a contractual basis, or create their own municipal police agency. When to pursue these alternatives further complicates the issue. For some administrators, the question then becomes when they should form a police agency. Is creating its own police force as soon as they can afford to in the best interest of the community, even if that means creating a small department with only a few officers? If size relates to a department's ability to provide effective services, should the community wait until they can afford a larger force?

Nearly every community has access to police services, even if they do not have their own police force. Many small communities receive police services from a regional department, such as a county police department or sheriff's office, or a state police force. This means the question is not whether a local police agency can provide services that were not previously available to the community, but rather whether a local agency can provide a higher level or quality of services. An underlying consideration running throughout these questions is the issue of agency size. Does the size of the agency play a role in their ability to deliver quality services? Answering this question can give insight to the question of whether and when a community should undertake the cost and effort to establish their own police agency.

Unfortunately, answering the question of what affect agency size on effectiveness is not easy. The mission of the modern police department is complex and evolving. Community demands for crime prevention, crime fighting, and a variety of services, are dynamic and are rarely uniform across

communities. This can make the task of evaluating police departments difficult. The difficultly in assessing police performance is similar to assessing the performance of many public service related industries: Exactly what should be measured? What makes a "good" police department or how can analysts determine if one department is doing a "better job" than another department? Maguire and Uchida (2000: 60) point out that a modern police organization provides a wide variety of services. They make arrests, process offenders, find lost children, quell disturbances, respond to emergencies, solve problems, form relationships with the community, and perform many other activities too numerous to summarize briefly. The sum of these activities is what constitutes the services or products of any police organization.

Measuring all of these products and services is difficult, if not impossible. More importantly, police services vary from agency to agency and community to community. The first step in making a comparison across agencies is to identify functions or services that are "universal" or that nearly all police agencies provide. Most citizens and police officers view the job of law enforcement as crime fighting. This has historically meant preventing, seeking out and solving crime (Reiss, 1992). Even with the changes in policing in recent years, those basic goals remain. According to the American Bar Association (1980), one of the primary functions of all police agencies is the competent investigation of crimes reported to them. Indeed, 47 of the 50 states mandate the law enforcement role for the police in their legal codes (Burton et al., 1993). This dissertation hypothesizes that the investigative function, especially for serious offenses, is more effective in larger police departments. That is, larger police agencies will

solve *proportionally* more of the crimes they investigate with all other factors held constant.

Importance of the Topic

For more than 50 years, researchers and practitioners have debated the importance or effect of a police agency's size. Starting in the 1950s and fueled by increasing crime rates, combined with calls for increased levels of police accountability and professionalism, there were calls to improve the effectiveness and efficiency of the nation's police departments. Many of the initial recommendations involved reducing the inconsistent and fragmented nature of the country's police. For many, creating larger, more professional police forces through consolidation or regionalization provided the best solution (Murphy & Plate, 1977).

The concerns regarding smaller police agencies dealt with these smaller agencies and their inability to deliver the full spectrum of police services. In its report, President Johnson's Crime Commission (The Challenge of Crime in a Free Society, 1967) was critical of the fragmented nature of policing and noted that small agencies may not be able to supply services like scientific analysis, communications, officer training, pretrial detention and advanced investigative services. Supporters of larger police agencies believed that by utilizing economies of scale and drawing on a larger pool of resources and experience, larger agencies might be better suited to provide police services in the Twenty First Century.

Around the same time, a growing group from the early public choice perspective argued that bigger was not necessarily better when it came to police

departments. They saw smaller police departments (typically associated with the decentralized criminal justice system) as better suited to serving the specific needs of communities in which they were embedded. These smaller agencies could be responsive to changing demands of the community, could increase close contact between the police and the community, and could improve local police authority and effectiveness (Ostrom & Parks, 1973; Ostrom, Parks, & Whitaker, 1973).

Since then, the debate over the impact of police agency size has continued with two distinct elements. Part of the challenge has been trying to determine what agency characteristics, structure, and techniques are important and are most likely to lead to a higher quality of police services. Even when there was agreement on the important elements, the second part of the challenge has been how best to measure the outcomes and outputs of those services. Devising measures that could accurately assess a police department's effectiveness has been complex and controversial.

Police agencies have historically collected data about their performance. Initially, these data tended to be locally focused and not comparative in nature (Maguire, 2007). By the mid Nineteenth Century, most police agencies collected statistic detailing their activities. These statistics were limited and typically involved the number of arrests for various crimes. The police collected numbers that were easy to collect, but numbers that did not necessarily reflect how well they were accomplishing their mission. According to Maguire and Uchida (2000: 498), many of the police departments formed in the mid to late Nineteenth Century were "created because of growing concern over riots and disorder.

Ironically, police statistics neither measured the number of riots they broke up nor kept track of disorder."

At the end of the Nineteenth Century and into the Twentieth Century, progressive reformers called for improvements to police leadership, organization, and personnel. From 1890 to 1920, the role of the police narrowed and their focus turned to crime control, giving up many of the service activities unrelated to crime in which they had previously engaged (Uchida, 2005). This was the beginning of the professional model of policing, a model that dominated policing in the United States through the 1980s. The model emphasized an administratively efficient department, with qualified personnel, operating without inappropriate external influences. Around this time, there were increasing calls for the development of comparative measures of police performance (Bellman, 1935; Stone, 1930). At their 1927 convention, the International Association of Chiefs of Police (IACP) appointed the Committee on Uniform Crime Records to formulate a complete standard system of police statistics. The committee also recommended a standard annual police report (Mead, 1929: 75). The generally accepted reason for the creation of the Uniform Crime Reports was an effort to counter what the IACP considered a misinformed view offered by the press of crime waves (Rosen, 1995: 216).

By the 1940s, a variety of organizations, including the Federal Bureau of Investigation and the International City Managers' Association (now the International City/County Management Association or ICMA) were collecting data from police agencies (Maguire, 2007). With this increased availability of police statistics, researchers and administrators developed a variety of potential

measures or benchmarks in an attempt to meet the needs of different communities with differing (and constantly changing) expectations of service. These include input measures, such as budget expenditures, number of personnel and hours spent involved in an activity (for example, patrol or investigation) as well as output measures such as number of calls answered, crimes investigated or number of arrests. Additionally, outcomes (such as, crime rates, deaths and injuries from crime, property losses or citizen satisfaction) and efficiency (such as, cost per crime or clearances) measures can be used to assess police performance.

Despite the variety of measures, there has not always been consensus on what they actually measure and which measures are best. Many of the measures for judging the police are controversial (Ammons, 1996). For every measure, there are critics who are quick to point out the flaws or mitigating factors that researchers must consider or include in the discussion. The reality is that researchers and practitioners have few (if any) measures that can directly assess the police without considering the impact of other, often non-police related factors. In recent years, research has linked a variety of community and social factors beyond actual police performance to many of the commonly used measures. The result has been that over the past 50 years, researchers, administrators and policy makers have continued to debate the issues with little consensus on how best to measure police performance (Lind & Lipsky, 1971).

Despite the lack of consensus on how best to measure police activity, there has been no shortage of studies and efforts to do just that. Many of those studies focus on crime rates as a measure of police effectiveness. While the

efforts of the police undoubtedly affects crime rates, most practitioners and researchers recognize that crime rates are the result of much more than just police activities (DiIulio, 1993). As a result, the need to accurately assess police activities increasingly challenges researchers and practitioners to identify measures that are valid measures of police activity. The multifaceted police mission complicates this task. However, most police officials, researchers, and citizens agree that the crime fighting mission is central to the police's responsibility.

This study focuses on one of the core element of police performance, the criminal investigation. Research into this area is not as plentiful and according to Skogan and Frydl (2004: 15), what little research is available on the factors that can impact investigation is dated and provides no systematic evidence on what industry structure best promotes effectiveness or innovation. This study would address a key element in this debate: the effect of police agency size on investigative effectiveness.

Theory Base for Research

This study proposes to identify the effect of a police agency's size, as measured by the number of sworn and non-sworn employees, on its ability to clear crime. The general hypothesis is that larger police agencies with more officers and support staff are better suited to provide higher quality or better services for their communities. Advocates of larger agencies claim larger agencies will produce a variety of benefits, including a higher volume of police services, lower response time, lower overall operating costs in the form of reduced overtime and reduced or eliminated overhead and management

(Krimmel, 1997). Proponents of larger agencies also argue that the quality of policing is higher. In addition to the potential for reducing costs by taking advantage of factors traditionally associated with larger organizations, there are several reasons a larger agency could provide a higher level of services and ultimately being able to clear more reported crimes.

First, larger police agencies can allocate their resources more effectively. Generally, this means assigning staff based upon call volume. Providing minimum patrol coverage of two officers, 24 hours a day requires at last ten officers, according to the International Association of Chiefs of Police (IACP). The IACP also recognizes that call volume is not even between shifts, with more than 40% of the calls coming on the evening shift (Regional Police Services in Pennsylvania - a Manual for Local Government Officials, 2002). Larger agencies could assign staff to meet these varying demands. In addition to the patrol function, the investigative function would also benefit, since larger agencies could assign or dedicate personnel full time to investigative roles. These officers can commit their full attention to investigations, allowing the agency to develop investigative expertise and experience. Dedicated investigative staff should improve the agency's ability to solve the crimes reported to them.

Secondly, as agencies increase in size, they can dedicate staff to specialized investigative functions (versus general investigations), such as homicide, rape or robbery. Such specialization further increases expertise and, ultimately, performance. Specialization of investigative techniques will allow officers to take advantage of more training options and to utilize those skills in larger, more flexible and diverse departments. Conversely, police agencies with

few employees cannot dedicate staff to the investigative function and require patrol officers to take on all of the investigative responsibilities to their already diverse workload. The result of this multitasking could mean less effective and efficient investigations, resulting in the clearance of proportionally fewer crimes. If the analysis of this study supports the theory, the results should show that larger police agencies proportionally clear more reported crimes.

Finally, larger police agencies would have an investigative advantage because of the number of criminal events they could expect to handle. Larger agencies are typically associated with larger or more densely populated geographic areas. The larger the population, the greater the number of crimes and calls for service the agency would expect to receive. Developing expertise is critical to the successful completion of any tasks and criminal investigations are no exception. One of the keys to developing expertise is experience. One study of homicide units revealed that agencies with higher clearance rates had more experienced investigators (Keel, 2008: 3).

Over the years, scholars and analysts have developed a variety of specific benchmarks to assess the effectiveness of a police agency. For any organization, effectiveness is simply meeting the operational goals of the organization (Skogan, 1976). There are four generally accepted measures of police performance that have become the standard, to the point that police have developed specific reporting and documenting practices to support these measures. These traditional measures include: reported crime rates, overall arrests, clearance rates, and response times (Alpert & Moore, 1993). According to Hatry et al. (1992), these four measures can assess performance related to

they identified as the crime prevention and apprehension of offenders dimensions or objectives.

With the resurgence of community policing since the 1980s, scholars and administrators have developed other measures of police effectiveness as well. Under the community policing philosophy, police functions expand as police develop partnerships with communities and decision-making becomes more decentralized (Bayley, 1998). The police expand their goals beyond those associated with professional policing to include crime prevention, fear reduction and quality of life issues associated with modern urban living (Moore, 1992). To accomplish this, supporters and advocates of community policing suggest that law enforcement must become more focused, proactive, and community sensitive. Some have suggested that the older "professional model" of policing with its emphasis on department structure, regulations and crime fighting, may no longer be the most appropriate model.

Departments implementing community policing can expect significant changes to both the social and formal structure of their organization. Supporters hope community policing can break down the barriers separating the police from the public while inculcating police officers with a broader set of community service ideals (Greene, 2000: 301). The question becomes, does this change of strategies necessitate the development of new performance measures that focus on factors beyond crime prevention and criminal apprehension? While there is clearly a need for newer community sensitive performance indicators, the reality is that community policing is not completely different from traditional policing. Community policing supporters remind everyone that community policing is not

necessarily bringing or implementing new values or priorities. Rather, it promotes a rearranging of priorities or reemphasis (and de-emphasis) of older policing values (Moore, 1992). Community policing did not eliminate the goal of crime control. Rather, community policing adds the goals of order maintenance and service provision to crime control. A series of studies looked at policing and the emphasis placed on three core functions (order maintenance, service delivery, and crime control) during the period when community policing became more pervasive (the 1990s and 2000s). The studies confirmed that the emphasis has remained on functions consistent with the professional model of policing, especially crime control (Zhao, He, & Lovrich, 2003; Kraska, 2001; Lyons, 1999). While this result may be disappointing to community policing advocates, it does illustrate that the traditional mission of policing continues to be important. With this in mind, measures that can assess a department's ability to prevent crime and apprehend criminals continue to be useful for researchers, police agencies, and citizens.

The problem is that operationalizing such measures is not always easy and, in some cases, is not possible. For example, measuring the amount of crime prevented is not possible. To assess a department's ability to prevent crime, many use measures that can theoretically, based upon some generally accepted criminological theory, reduce or prevent crime. For example, according to rational choice theory, the ability to identify and apprehend the persons responsible for crimes could reduce the rate of crime in a community. Logically, as criminals learn that the police are more likely to arrest them in certain jurisdictions (that is, those protected by agencies that are more effective), rational criminals would be

expected to move to jurisdictions with less effective agencies. Although no studies have looked at the direct impact of improvements in police investigation techniques, researchers and practitioners have generally assumed that an increase in the likelihood of a crime's being solved through arrest would lead to a deterrence or incapacitation effect (Weisburd & Eck, 2004: 50).

Even the apparently straightforward and direct measure of police activity and effectiveness, crime rates, is not as straightforward as it might first appear. Crimes rates rise and fall, with the police often taking credit for drops, but spreading blame when they rise (Blumstein, 1996). The reality is somewhere in the middle, with policing efforts being just one of a multitude of factors that can affect crime rates. In addition to police activities, the efforts of sheriff's department, the prosecuting attorney, judges, court personnel, probation and parole officers, reform schools, prisons, jails, social welfare agencies that treat deviant behavior, the school system, and the family are also critical to the prevention of crime and delinquency (Wadman & DeLadurantey, 1984: 227-228). With the renewed interest in community policing, there is also concern that focusing on crime rates alone may divert attention from other important goals, such as equity, fairness, or other more humanistic comparisons (Mastrofski, 1999).

Although crime *rates* are a frequently cited statistic, and Governmental Accounting Standards Board (GASB) lists them as an outcome measure, crime rates alone may not be well suited for assessing the efforts of police agencies (Ammons, 1996). Even the source of the most frequently cited crime statistics, the Federal Bureau of Investigation (FBI), cautions potential data users against

simply comparing statistical data of individual reporting units (United States Department of Justice, 2007b). According to the FBI, in addition to policing efforts, crime rates can also vary by population density, degree of urbanization, variations in composition of the population (particularly youth concentration), economic conditions (such as median income, poverty level, and job availability), cultural factors, and family conditions with respect to divorce and family cohesiveness (United States Department of Justice, 2006b).

Similarly, departments have assessed performance by examining the number of arrests, since a basic police task is to apprehend offenders. While arrests may be the result of good, effective police work, a variety of factors other than investigative efficiency may influence the number of arrests. For example, policing style (community versus professional) places different emphasis and importance on arrests. Community pressures and demands can also drive departments to either increase or decrease the number of arrests they make. Another common police measure is response time, which is the time it takes the police to arrive at the scene of a crime or complaint from when they receive the call. The logic supporting the use of this measure is that the sooner police can arrive at the scene of a crime, the more likely they are to save lives, prevent property loss and ultimately to solve the crime. Despite the logic, the research has not shown a link between response time and solving crimes (Stevens, Webster, & Stipak, 1980; Weisburd & Eck, 2004). Practically, response times are more a measure of administrative and staffing styles, methods, and community size and as such, they may not be a good indicator of police performance.

Of the four traditional measures identified by Alpert and Moore, the most

direct measure of investigative effectiveness would be clearance rate. A primary mission or goal of any police agency is to solve crimes reported to it. Even with the renewed interested in community policing, the ideology of good policing still includes the crime fighting mission, and public and political expectations is that the police solve crimes and lock up criminals (Skogan, 1976). In practical terms, the mission of all police agencies continues to be solving as many of the crimes reported to them as possible. While solving all of the reported crime may not be possible in all but the smallest jurisdictions, departments that solve a greater percentage can argue they are doing policing better than agencies with lower clearance rates.

The standard measure of crime solving is the Uniform Crime Report's clearance rates. An agency's clearance rate is simply the number of the number of criminal incidents in which at least one person is charged and/or arrested for the offense, divided by the total number of incidents known to the police (Paré, Felson, & Ouimet, 2007: 244).

Summary

The hypothesis of the study is that larger agencies should be able to clear a greater percentage of the crimes reported to them, holding all other factors constant, than smaller agencies. This is based on the theory that larger agencies are more efficient and effective in the allocation, distribution and use of resources, primarily manpower and they will solve a greater percentage of reported crime than will smaller agencies. This study uses clearance rate as a measure of police agency investigative effectiveness. By comparing different sized agencies, the study should be able to determine if size positively (or negatively) influences an

agency's ability to clear reported crimes. If the analysis supports the hypothesis, the study will also be able to measure the magnitude and direction of the relationship. If the theory is not accurate, size will not affect agency size and smaller agencies will clear the same (or greater) percentage of reported crimes as larger agencies.

There are two possible outcomes of this research, and each outcome has significance and value. The first is that the analysis supports a finding that agency size does have a positive association with its ability to clear crimes; that is, larger agencies are more likely to clear a greater percentage of crimes reported to them. Such findings would support an argument in favor of increasing agency size, either through hiring or organizational arrangements or implementing other regional strategies that could take advantage of effectiveness gains. The alternative is that there is no increase (or even a decrease) in the likelihood of larger agencies solving a greater percentage of reported crimes. This outcome would add support to proponents of smaller, more locally controlled police agencies since they could also list increased serious crime clearance rates to the list of advantages they offer communities.

The hypothesis of this study is that the relationship between agency size and clearance rate is positive but not linear. The hypothesis predicts that there will be several changes in the slopes curve and that curve may be ultimately valuable in identifying optimal agency size, based upon jurisdiction size and characteristics.

Chapter 2 examines the prior research looking at police efforts and clearance rates, and includes a discussion of performance measurement. The

chapter will examine previous research into both the effect of agency size on clearance rates, as well as the use of police outcome and output measures. Chapter 3 will discuss the data, including source and selection, as well as the development and operationalizing of the control variables. Chapter 3 also discusses the model and analysis techniques. Chapter 4 is a discussion of the results of that analysis. Finally, Chapter 5 will summarize and discuss the significance of the study's findings.

CHAPTER 2: SIGNIFICANT PRIOR RESEARCH

The purpose of this study is to examine the impact or effect that the size of a police agency has on its ability to clear reported crimes. The primary hypothesis is that larger agencies are better suited for solving crimes, and they will clear a greater proportion of the crimes reported to them. This study is important because of the unique nature of policing in the United States. A review of policing in this country shows that here is little uniformity or consistency in the nature and delivery of police services (MacNamara, 1950; Wilson, 1968; Maguire, 2002; Wells & Falcone, 2005). There are a multitude of municipal, county, state and federal agencies providing police services and those agencies differ in size, jurisdictions, operational methods, goals and responsibilities. Even the apparently simple task of counting the number of police agencies and officers working in the United States turns out to be not very simple. As a result of the fragmented nature of law enforcement in the United States, determining the exact number of police officers and police departments is difficult, if not impossible (Bayley, 1992: 512). Over the years, various attempts have come up with widely divergent estimates (Maguire et al., 1998).

Set against this unique backdrop, it is important to examine the research of this fragmented system of policing. This section begins with a look at the various attempts to determine exactly how many officers and departments (and the sizes of those departments) actually provide services in this country. This study then

examines the historical perspectives regarding the advantages and disadvantages of smaller agencies and their ability to most effectively provide services. Critical to evaluating the different perspectives is understanding the various measures that researchers use to assess agency performance, so a brief overview of performance measure is included. What follows is a look at the history of police statistics, including the measure this study utilizes, crime clearance rates. The chapter concludes with a look at research that examines police investigations and the various factors that can influence them.

Counting the police has been difficult because historically there has been no single agency or entity responsible for such information. Since the 1930s, the FBI has collected crime and police data, but that program was (and remains) voluntary and the FBI does not claim that it is an accurate accounting of police in this country. Prior to the 1970s there were no formal surveys or accounting of police agencies in the United States, and as a result, different studies and sources came up with different estimates (Maguire et al., 1998). For example, in 1967, President Johnson's Crime Commission estimated the number of police agencies in this country at 40,000 (The Challenge of Crime in a Free Society, 1967: 91). During the 1970s and 1980s, both the Census Bureau and the Bureau of Justice Statistics (BJS) conducted a more formal survey to estimate the number of police in this country. These efforts estimated there were between 15,000 and 20,000 police agencies. While there was still variation in the totals, there were significantly less than many of the earlier estimates.

In 1990s, the Office of Community Oriented Policing Services (COPS), a component of the US Department of Justice, set out to develop a single list of all

police agencies in the USA. That study looked at two major sources of police officer statistics, the FBI's Uniform Crime Report and the Directory Survey of Law Enforcement Agencies (LEDS). The study compared them to the COPS office own database of police agencies and examined them for overlap. The study not only produced a new estimate on how many police officers and agencies there are, but it also highlighted the difficulty in counting those police officers and agencies (Maguire et al., 1998). Those problems included everything from minor coding errors, to double counting, to the inability to define exactly who is a police officer and what should be considered a police agency.

The result of the COPS study was that there may be as many as 21,143 local, state, sheriff, special and federal law enforcement agencies operating in the United States with 681,012 employees (Maguire et al., 1998). These agencies have an average of 32 officers. However, even these agency and staffing estimates that are more accurate do not give an accurate picture of policing or police agencies in this country. The reality is that there are only a few very large departments. The vast majority of police departments are relatively small; much smaller than the average would suggest.

According to the 2000 Census of State and Local Law Enforcement Agencies (CSLLEA) survey, there were only 76 police agencies with more than 1,000 sworn officers and only two with more than 10,000 sworn officers, New York City with 40,435 officers and Chicago with 13,466 officers. The reality is that in the United States, there is a predominance of very small police departments employing only a handful of full-time or part-time staff (Maguire et al., 1998: 111). Of the 16,784 police agencies listed in the CSLLEA survey for 2000, the mean

number of sworn officers was just under 40, but the median number of officers was 9. More than half of American police agencies have less than 10 officers, approximately 1,900 departments have only one full-time sworn officer, and 231 police agencies employed no full-time sworn officers, relying solely on part-time employees for law enforcement services.

The Effectiveness of Small Police Agencies

The number and size of local police agencies is a uniquely American phenomenon. A strong belief in the principles of local autonomy, combined with a fear of a police state created a situation where each local government, regardless of how small or how weak, have historically insisted upon its own police department (Peterson, 1957). The result is that we may have more than 20,000 police agencies in this country, many with only a handful of police officers. The preponderance of smaller police agencies became a source of concern as early as the 1930s. In 1929, President Hoover established the Wickersham Commission to identify the causes of crime and look at the current state of policing. Among its many findings, the committee noted that the independence and lack of any central force of police forces contributes to the profitability of criminal operations (National Commission on Law Enforcement, Report on Police, No. 14, June 26, 1931).

The fragmented nature of policing became the subject of concern and debate by the 1950s and 1960s. MacNamara (1950: 181) described an American policing system that was “sprawling, complex, expensive, inefficient, and confused pattern of vertical and horizontal duplication, fragmentation, and overlapping.” He went on to say the most inefficient, and therefore the most

expensive element of the system, was the small police agency. Even police agencies with 50 officers could not attract the best recruits or administrators, could not provide adequate training facilities, and had to dedicate so much of their personnel to administrative and housekeeping tasks that they reduce effective police strength to the vanishing point. MacNamara reported that in cities with a population of less than 25,000, the average police strength is eight officers. Given the nature of policing, generally requiring at least 2 officers working 24 hour coverage (combined with needed administrative demands, sick leave, vacations, court time, etc.), the result is that these small agencies cannot even provide minimum coverage and "must be ineffective." MacNamara's report went on to suggest a variety of solutions, such as consolidation, regionalization, shared services, but ultimately felt that "elimination of the smaller units is an essential element in the reform of the American police system" (1950: 184-185).

Wilson (1954) identified ten factors associated with local policing that contributed to unsatisfactory service. They included insufficient and unwise use of manpower, inadequate equipment, inferior procedures, inadequate training, personnel deficiencies as well as weak and inefficient leadership (1954: 103-104). Wilson identified several potential solutions and included several of the recommendations from the Third Interim Report of the Special Senate Committee to Investigate Organized Crime in Interstate Commerce (Organized Crime in Interstate Commerce Hearings, May 26, 1950 through August 7, 1951). Wilson concurred with the committee, which felt policing would benefit from increasing cooperation between agencies, centralizing the responsibility for law enforcement of the criminal law, and striving for greater efficiency.

For many, creating larger, more professional police forces through consolidation or regionalization provided the best solution. For example, in the Chicago area, Linkon (1952) examined the structure and functioning of the more than 90 separate independent policing organizations that provided law enforcement services to the Chicago/Cook County area. He found that policing in Chicago, like other areas of the country, was inadequate because of the duplication of efforts and overlapping jurisdictions, the lack of coordination of police activities and inadequacies within individual forces. He recommended three possible solutions, including supervision and coordination at the state level, increasing the number of cooperative arrangements between local agencies or reorganization through consolidation at the local level (Linkon, 1952: 70). By the 1960s, the desirability of consolidating or at least coordinating police efforts was generally recognized by administrators, as was the political challenge of such efforts (Misner, 1960). Misner supported the idea of making county level law enforcement the standard for urban areas.

In 1967, President Johnson's Crime Commission Report (The Challenge of Crime in a Free Society) examined crime and policing. With respect to police agency size, the commission felt that smaller agencies would not be as effective as larger agencies, and recommended regionalization of specific law enforcement services where appropriate. The commission recommended regionalizing functions like intelligence, communications, records, crime laboratory services and creating arrangements where specialized personnel from state or large metropolitan police forces assist smaller departments with major investigations and specialized police investigations. The commission went on to recommend

that metropolitan areas study the possibility of contract or consolidated police forces.

Several years later, both the National Advisory Commission on Criminal Justice Standards and Goals and the Advisory Commission on Intergovernmental Relations (ACIR) expressed similar concerns. The ACIR looked at policing and made 15 recommendations aimed at improving the professionalism of police as part of their study of the nation's state-local criminal justice system. The ACIR report concurred that smaller agencies, those with less than ten officers, struggle to provide even basic patrol services, not to mention investigative and critical support services (1971: 2). The National Advisory Commission on Criminal Justice Standards and Goals agreed with the ACIR's findings and took President Johnson's Crime Commission recommendations a step further by recommending that small departments (less than 10 officers) be eliminated, possibly through consolidation (Report on Police, 1973).

The Public Choice Perspective

Concern over small agencies was not universal and during the 1970s supporters of the public choice perspective challenged many of the claims and concerns regarding smaller departments. This perspective has its roots in an idea formulated by Tiebout (1956) and later refined by Ostrom, Tiebout and Warren (1961) that smaller governments can be more responsive to their citizens and provide a service package that better suits the individual citizens needs. For policing, public choice advocates base their arguments upon two assertions. First, larger police department are not necessarily more efficient than smaller departments and second, smaller departments score higher in citizen satisfaction

studies than larger departments (Pachon & Lovrich, 1977).

Ostrom and Smith (1976) counter the claims of the supporters of larger agencies by pointing out that the research on the relationship between the size of government and the cost of providing services has consistently found there is no evidence to support the claim that larger governments can provide police services less expensively. The provision of police services is a very labor-intensive function, with 80% to 90% of budget costs going towards personnel (Ostrom, 1976). Public choice proponents argued that with personnel cost consuming the majority of the budget, there would be little "economy of scale" benefits. A U.S. Advisory Commission on Intergovernmental Relations report suggested there is even evidence that diseconomies of scale may exist for large municipalities with populations over 250,000 (State-Local Relations in the Criminal Justice System - a Commission Report 1971: 301). While the evidence is generally inconclusive, public choice proponents point out that the evidence does not support the claims of consolidation supporters that larger agencies can provide police services more efficiently (Ostrom & Smith, 1976).

In addition to the belief that larger agencies did not provide an economic advantage, public choice proponents also countered the claims that smaller police departments could not be as effective as larger departments. Ostrom, Parks and Whitaker (1973) found that the high degree of specialization and professionalization so frequently cited as a need for larger departments is not prerequisite for effective policing. In their study, Ostrom, Parks and Whitaker used the outcome measures of citizen evaluations of the police and crime rates and input measures comparing patrol officers per square mile and population

served. Looking at the City of Indianapolis and surrounding communities, they found a general pattern of higher levels of police outcome in the surrounding communities. Citizens of the smaller communities generally rated their police as responding rapidly, did not believe crime was increasing, rated the police-citizen relationship as good and generally believed the police were doing a good job. Another study that compared small and large departments, with similar residential neighborhoods, found that smaller departments tended to be more "client oriented" and utilized less aggressive enforcement styles (Parks, 1979).

Issues related to Agency Size

The argument between those in favor of larger police agencies and public choice proponents hinges on the measures used to assess police agencies. Supporters of larger (consolidated) agencies frequently base their arguments on assumptions regarding the size of organization identified as early as the 1950s. These include the belief that multiple smaller agencies unnecessarily duplicate efforts, cannot provide a full spectrum of services, and have limited effectiveness because of the lack of coordination (Linkon, 1952; The Challenge of Crime in a Free Society, 1967; Report on Police, 1973).

As discussed previously, there are a variety of reasons that proponents of larger police departments believe that the larger agencies are more effective. First, larger police agencies can allocate their most important resource, their personnel, more effectively. Larger agencies can assign staff to meet the variations in call volume typically experienced by police agencies. In addition to patrol staffing, larger agencies could assign or dedicate personnel full time to investigative roles. Dedicating staff to the investigation function allows these

officers to commit their efforts full time to investigations. Conversely, small police agencies must focus their efforts on basic, patrol services and often cannot dedicate staff to the investigative function. The option of committing personnel to the investigative function full time allows officers to develop investigative expertise and experience, ultimately leading to improving the agency's ability to solve the crimes reported to them (Horgan, 1980).

Another advantage that larger police agencies may have is they typically have larger geographic areas and population. One advantage of larger jurisdictions is that it lessens the ability of criminal activity to move from one jurisdiction to another to escape detection (Staley, 2005). Since police jurisdictional boundaries do not limit offenders, uncoordinated investigations may be less likely to recognize patterns or identify serial crimes. Larger agencies are typically associated with larger and/or more densely populated geographic areas and the larger the population, the greater the number of crimes and calls for service the agency would expect to receive. Developing expertise is an important element to the successful completion of any tasks and criminal investigations are no exception. One of the keys to developing expertise is experience. One study of homicide units revealed that agencies with higher clearance rates had more experienced investigators (Keel, 2008: 3).

In addition to the operational advantages available to larger agencies, supporters also tout the economic advantages. Proponents of larger agencies have suggested that larger department provide greater cost efficiency because they serve more citizens (Schaemman & Kalish, 1972; Skogan, 1976). Increases in population or in a geographic patrol district size can decrease per capita costs,

with the same number of officers serving more citizens. These include a reduction in costs through eliminating duplication of services between departments allowing provision of new services with the money saved.

This argument assumes that an optimal level of officers to citizens can be determined. The reality is that such measures are difficult to quantify and maximize and as a result, public choice advocates often reverse the argument. They point out that smaller departments often supply a much higher density of patrol than larger agencies (Ostrom, Parks, & Whitaker, 1978). In their review of policing in 80 metropolitan areas, they found that departments with less than 10 officers have an average ratio of 2,400 citizens per patrol officer, as opposed to agencies with more than 150 officers, where the ratio is more than 4,200 to 1. Put another way, per 10,000 citizens, small departments average 4 patrol officers in the field, versus 2.4 for larger agencies. When considering citizen to officer ratios, small departments also benefit because they typically have most (if not all) of their force involved in the patrol function. In small departments, even the Chief of Police may have patrol responsibilities, or at least first line supervision duties for patrol officers.

A major concern with the use of input measures such as officer per capita is that it is difficult to determine what level of input measure will result in the desired output or if there even is a direct correspondence between the inputs and outputs. While there may be an optimal ratio of officers to citizens, it is likely that that ratio will vary between agencies and be dependent on a variety of other community demographics measures. This means that direct comparisons of agencies may be problematic.

In addition to the per capita measures, both sides also address the economies of scale aspect associated with organizational size. The delivering of many services is more effective on a larger scale, although the optimal size of a jurisdiction will vary with the type of service delivered. While goods intensive functions generally see a greater benefit from economies of scale than labor intensive services (Oakerson, 1999) there is mixed evidence to support economies of scale in police agencies. In one study of economies of scale for municipal police departments in Florida, Gyimah-Brempong (1987) found no such economies. Similarly, a more recent study found that there are probable economies of scale for services which require specialized expertise and advanced computer applications, in other municipal-level services, including police services there are negligible or marginal economies (or even diseconomies) of scale (Becker & Dluhy, 1998: 84-85). For public choice advocates, the preponderance of the evidence indicates that small local governments are more efficient for labor-intensive services, such as policing services (Altshuler et al., 1999: 106).

Critics of the public choice perspective point out that despite any claim to the contrary, there is evidence to support the belief that larger governments may be as or more efficient than smaller ones (Pachon & Lovrich, 1977). Admittedly, the research is mixed, but Walzer (1972) did find support for the economies of scale hypothesis when using service index, such as offenses cleared, number of accidents investigated, and miles traveled by police vehicles. Walzer concludes that while the results are not strong, dismissing consolidation as a cost saving measure would be premature. Chapman, Hirsch and Sonenblum (1975) also

found economies of scale when examining the Los Angeles Police Department during 1956 to 1970. They found that the police agency seemed to enjoy the benefits of increasing returns to several of its manpower related resources, particularly field officers, civilians, and motorcycle teams. Newton (1982: 195) was more assertive when he said that "So far as the service-providing functions of local government are concerned, therefore, it seems that large units are no less efficient and can be a good deal more effective than small ones". More recent and sophisticated studies have also supported the possibility of economies of scale. According to Marche (1989), recent studies control for changes in work quality and differences in operational environments. Failure to control for environmental effects will cause a bias against scale efficiencies (Marche, 1989: 90).

The end result is that many of the cost and economies of scale arguments provide little clear guidance on whether communities should seek smaller or larger police agencies. Without cost measures, assessing the quality of services produced by the police becomes key. Unfortunately, the problem of measuring police performance is complex because of there are few direct measures. Policing is part of the criminal justice system and as such, many of the indicators are dependent upon other parts of the system. As a result, using a measures such as crime rates is less than ideal, since crime rates may well depend upon the actions (or inactions) of other elements of the system.

Public choice advocates solve the challenge of measuring police performance by collecting performance data from interviews with a random sample of households served by small and large agencies. Utilizing information

related to victimization, willingness to call the police, speed of police response, amount of police follow up, and satisfaction levels, researchers where able to evaluate the quality of policing in matched or comparable neighborhoods (Ostrom, 2000). The result of this approach is a series of studies that find small and medium sized police departments perform more effectively than larger departments (Ostrom & Parks, 1973; Ostrom, Parks, & Whitaker, 1973; Ostrom & Whitaker, 1974; IsHak, 1972; Rogers & Lipsey, 1974). For public choice proponents, the answer is clear, smaller is better when it comes to certain aspects of policing.

Critics of the public choice perspective were quick to point out that much of the research focused on a single outcome: citizen satisfaction (Skogan, 1976). For some, the use of surveys in assessing police performance may not be the best tool. Surveys have been utilized for some time to gauge citizen feelings and perceptions of the police and they generally show a high degree of satisfaction with the police (Schuck & Rosenbaum, 2005). For example, a 1998 survey of residents of 12 American cities by the Office of Community Oriented Policing Services (COPS) found that 85% of respondents were either satisfied or very satisfied with their local police (Smith et al., 1998). However, the ACIR cautions against using public opinion polls and general ratings from citizen surveys as complete assessment's of police performance (1988: 63). The ACIR identified several reasons for this. First, general ratings are usually more favorable than are assessments of more specific police actions, such as responding rapidly when called, providing assistance, preventing crime and disorder (White & Menke, 1978). Secondly, city or countywide averages can mask significant

internal variations. For example, in the 1998 COPS survey, the overall high responses masked significant variations when broken down by race. The COPS survey found that only about 1 in 10 white respondents were dissatisfied with their local police, while nearly 1 in 4 black residents were dissatisfied (Smith et al., 1998). Finally, the link between objective performance measures and the more subjective citizen feelings or perceptions of the police has been inconsistent. The concern is that citizen responses to satisfaction and evaluation questions may not reflect actual service performance (Stipak, 1979). Questions regarding what criteria citizens use to evaluate services and how much accurate information they actually have about the services raise concerns regarding the validity or accuracy of citizen satisfaction surveys and the correlation between survey results and objective measures is not always strong or even present (Kelly & Swindell, 2002).

When considering citizen survey results, the link between race of the respondent and approval level of the police has been well established. Numerous studies have examined citizen perceptions of the police and found minorities (especially African-Americans) often have lower opinions of the police than white residents (Flanagan & Vaughn, 1996; Huang & Vaughn, 1996; Waddington & Braddock, 1991). While race is an important variable in predicating level of satisfaction with local police, other variables also contributed. For African Americans, like white citizens, demographic attributes such as age, level of educational attainment and gender, and the nature of their police interaction (voluntary versus non-voluntary) were significant factors. For African-Americans, their ‘‘stake’’ or commitment to their neighborhoods (as measured by homeownership and marital status) was also important in predicting perceptions

(Huebner, Schafer, & Bynum, 2004: 132).

In addition to race, age has also been shown to be related to perceptions of the police, with youth often holding more negative attitudes toward the police (Peek, Lowe, & Alston, 1981). Using data from a 1973 national survey, Peek Lowe and Alston found that while race was a significant factor, age was a better predictor of attitudes toward the police. That study also found that among blacks, socioeconomic status variables and sex account for nearly three-fourths of the explained variance in these attitudes (Peek, Lowe, & Alston, 1981: 370). Other studies have also found a link, albeit a weak one, between income and education and attitudes toward the police (Brown & Coulter, 1983; Fitzgerald & Durant, 1980).

One of the possible consequences of this difference of opinion based upon age or race, is that agencies delivering equivalent levels of service but serving communities with a greater percentage of African American citizens or a larger percentage of young citizens may receive lower ratings or evaluations from their citizens than their counterparts serving older majority white communities. In many cases, agencies with large minority populations are larger, urban agencies, while their smaller suburban counterparts serve smaller, more homogenous and often predominately white communities. In a study of the St. Louis metropolitan area organizations, the ACIR cited two citizen satisfaction surveys that found the City of St. Louis received lower satisfaction ratings in the opinion polls than many of the smaller suburban agencies in the county. The ACIR attributed some of the lower scores on the fact that the city has significantly more low income and nonwhite citizens than does St. Louis County (Advisory Commission on

Intergovernmental Relations, 1988). Similarly, communities with a greater percentage of young citizens might also see differences in opinions of police services. This means that researchers and practitioners must at least consider (and more appropriately control for) the possibility that citizen satisfaction may have less to do with the quantity and quality of services and may be more about demographics and personal experiences.

For example, Brown and Coulter (1983: 57) found that citizen satisfaction does not appear to be related to the quantity and quality of services actually provided and service levels and satisfaction levels were totally independent. Hirschel, Lumb and Johnson (1998) looked at citizen satisfaction with the police and their handling of burglary investigations. They found a stronger link between citizen satisfaction and the manner in which the police handled a burglary investigation versus the effect of how successful the investigation was on satisfaction. They found that police actions such as processing the crime scene and providing follow up information was more important than arresting the offender or recovering property (two of the more commonly used objective measures of police performance) when it came to victim satisfaction. Another study re-examined citizen satisfaction results and found when controlling for the differing socioeconomic characteristics, the inverse relationship between size and satisfaction level disappears (Pachon & Lovrich, 1977). All of this raises the possibility that higher levels of satisfaction in citizen's responses in smaller suburban police forces that public choice proponents claim provide proof of better policing may be more a result of community demographics than higher service levels. As a result, a plausible conclusion is that smaller, suburban cities, which

one might expect to be, on average, older, more affluent and predominantly white might be predisposed to rate the police highly, regardless of the level or quality of services.

To complicate matters further, there is evidence that indicates residents of smaller cities and towns may not have a stronger voice in local police operations than residents of larger cities. For public choice proponents, a key advantage smaller entities have over larger ones is the opportunities for citizen control and input are enhanced and smaller size increases formal communication and control, resulting in more responsive police agencies (Ostrom & Whitaker, 1973). In their 1989 study, Lyons and Lowery challenged some of the assumptions typically claimed by public choice proponents regarding how citizens evaluate and relate to urban governments and the services they provide. They looked at two urban areas in Kentucky, Louisville typified by multiple small governmental entities and Lexington, which had operated under a consolidated government for more than 15 years. Using an 11 item indices, that included police protection, they examined citizen knowledge, involvement, and efficacy as it related to the delivery of a variety of services, in both urban and rural settings. They concluded that citizens in smaller, fragmented communities were "not significantly better informed, more efficacious, more participatory or more satisfied than their counterparts living in consolidated settings" (Lyons & Lowery, 1989: 540). Similarly, Newton (1982) argued that larger municipalities can be just as responsive as smaller municipalities or agencies and citizens can be just as involved or engaged. He concluded that "size is largely irrelevant to many aspects of functional effectiveness and democracy, although its effects seem to

be beneficial rather than the opposite in some regards" (Newton, 1982: 205-206).

The public choice perspective relies heavily on the results of citizen satisfaction surveys to support the position that smaller, more fragmented police structures provide a higher quality of policing. However, the research on citizen satisfaction in general is divided and the use of citizen satisfaction surveys may not be the best (and should not be the sole) measure of police performance outcomes with outcomes influenced by a variety of measures that are not driven by police outputs. This leads to an obvious question: what is a good measure of police performance?

Performance Measures

Any discussion of police effectiveness or quality must begin with an overview and discussion of performance measurement in general, as well as a discussion of its role in policing. The General Accounting Office (GAO) defines performance measurement as the ongoing monitoring and reporting of program accomplishments, particularly progress toward preestablished goals (United States Government Accountability Office, 2005). The GAO's definition continues by noting that performance measures may address the type or level of program activities conducted (process), the direct products and services delivered by a program (outputs), or the results of those products and services (outcomes).

Scholars generally agree that the beginning of government performance measurement is synonymous with the rise of government research at the New York Bureau of Municipal Research at the beginning of the twentieth century. The aim of these early efforts was to hold government accountable, allocate resources (budgeting) and to ensure the effective use of those resources

(Williams, 2003). For much of the first half of the twentieth century, the focus of these efforts continued to be accounting, reporting, and cost effectiveness and was the foundation of several performance budgeting movements.

In the 1920s, Clarence Ridley, who went on to become the executive director of the International City Managers Association (ICMA, now International City/County Management Association) and a professor at the University of Chicago, became a strong advocate for performance measurement. One of his associates, Lent Upson, served on the committee of the International Chiefs of Police that created the Uniform Crime Report in the 1930s. By the 1950s, the ICMA had been recommending performance measurement and management efficiency programs for 20 years (Williams, 2004). Under Ridley's guidance, performance measurement had moved away from the use as a citizen communication tool about the objectives of government and towards a management tool concerning the responsiveness and achievement of government.

Over the next 20 years, performance management focused primarily on budgeting, but in the 1970s and 1980s, there were a variety initiatives and efforts aimed at increasing productivity and efficiency of service delivery. The 1970s saw a steady increase in the use of performance measures in local government, with the efforts of local professional services (for example, police, fire, library and solid waste) accounting for much of the increase (Bouckaert, 1990). In the 1980s, productivity remained a main topic of public administration, taking a cue from private sector management (Bouckaert, 1990). Any discussion of productivity must, by definition, focus on inputs and outputs, and during this time pioneering

organizations like the American Society for Public Administration, the Government Financial Officers Association, the International City/County Managers Association, and the Urban Institute developed a variety of new performance related measures (Holzer & Kloby, 2005).

In the 1990s, the Governmental Accounting Standards Board (GASB) began the process of reporting on, assessing, and analyzing a variety of performance measurement tools used by governments. The GASB produced a series of reports entitled "Service Efforts and Accomplishments (SEA) Reporting: Its Time Has Come." Hatry and others at the Urban Institute provided the foundation for these measures. The SEA report on police performance identified several categories of such measures (*Performance Measurement for Government*, 2007).

The GASB measures include **inputs**, which are measures of the resources a department uses to provide a service. These include such measures as total dollars spent, or the number of officers or vehicles. **Outputs** are measures of a service provided, such as hours of patrol, crimes investigated or number of arrests. **Outcomes** are measures of the quality or effectiveness of a service. Outcomes might be crime rates, deaths, and injuries from crimes, the value of property lost to crime, citizen satisfaction, or sense of safety. Outputs, as differentiated from outcomes, attempt to measure how much of a service an agency provides while outcomes try to measures the accomplishment or results that occur (at least partially) because of those services provided. Outputs measure how much, while outcomes attempt to measure how effective.

The GASB also identifies another category of performance measures:

efficiency indicators. **Efficiency** indicators measure the amount of resources required to produce a single unit of output or to achieve a certain outcome. The GASB recognizes that several explanatory variables are relevant to and have an impact on service performance. Such explanatory variables include demographic, socioeconomic and other factors that are largely beyond the control of the agency, including median household income, unemployment, or dollar value of property in jurisdiction (Drebin & Brannon, 1992).

Not all researchers and administrators have accepted the development and implementation of performance measurement in policing. There is an understandable reluctance on the part of some police administrators to adopt measurement tools. For some administrators, accurate measurement is tantamount to providing critics of their agency with the ammunition needed to attack administrators (Moore & Braga, 2003b). Reluctance to use performance measures as the only tool to assess organizational effectiveness is not limited to practitioners. There is growing concern that the movement towards reform practices advocated by new public management techniques will not actually produce tangible or long lasting results (Jones & Kettl, 2003). The task of measuring government is difficult (Forsythe, 2001; King, Zeckhauser, & Kim, 2002) and there is growing concern that governmental agencies may adopt (or be compelled to adopt) performance measures without undergoing substantive strategic planning (Hatry, 2002). Before beginning the process of developing performance measures, public program managers must first know what they are measuring. That involves developing a mission statement, establishing goals, setting objectives, and developing an action plan (Best Practices in Performance

Measurement: Developing Performance Measures, 2004). Failure to conduct such an analysis may result in measures ill suited or unable to actually measure what services an organization provides. Administrators faced with improperly implemented performance measures may choose actions that satisfy or achieve performance measures rather than accomplish their mission (Hatry, 2002). Even when development of such measures is feasible, it may not be practical, with cost of introducing and using performance measurement outweighing benefits and the concern that simply mandating performance may not improve performance (Halachmi, 2005: 504).

Despite the concerns, the new public management movement remains strong and police administrators and researchers have adopted many of its principles. The challenge has been identifying (and then measuring) the desired outcomes of policing. Complicating the task is the fact that policing is multi-dimensional and different police agencies may have different objectives (Maguire, 2007). There have been several attempts to identify the basic dimensions of police work. O'Neill, Needle and Galvin (1980) identified five basic dimensions: crime prevention, crime control, conflict resolution, general service, and police administration. These basic dimensions could provide a framework for individual agencies when identifying and quantifying their goals and objectives. The Urban Institute and ICMA also developed a set of measures that attempted to assess the effectiveness of various crime control measures (Hatry et al., 1992). These measures listed a series of objectives that included prevention of crime, apprehension of offenders, responsiveness of police, feeling of security, and a service dimension that would include fairness, courtesy, helpfulness,

cooperativeness, and honesty, with each objective having a set of quality characteristics or measures. Within each of these objectives, researchers and practitioners develop specific measures intended to assess police agencies.

The History of Police Statistics

While use performance management and performance measures have only come to prominence in recent years, its roots extend back more then 100 years. The police, like most organizations, have historically collected statistics detailing their activities as part of an assessment of their performance. Many of those early statistics were limited in their ability to help administrators effectively manage their organizations. As early as the mid-1800s, many police agencies began keeping statistics detailing their activities. Most of these early statistics were productive measures, which are essentially "bean counting" measures in which departments reported the number of officers and activity summaries such as the number of reports submitted or number of arrests. By the 1850s, most large departments were recording arrest data and reporting them in their annual reports (Maguire & Uchida, 2000: 498). The practice has continued today and many departments' still report basic productive measures, such as number of traffic citations or the number of miles driven by patrol officers. While these types of input and output measures are simple to collect and compare, they often are not reflective of the full range of activities in which a department is engaged (Wadman & DeLadurantey, 1984).

In 1910, the American Institute of Criminal Law and Criminology tasked the Committee on Statistics of Crime with assessing the status of judicial statistics keeping and then to formulate an adequate and uniform scheme for record-

keeping. The committee found that “in more than half the states no effort is made to collect and publish criminal judicial statistics and not a single state has yet to publish wholly adequate criminal justice statistics” (Koren, 1910: 421). While most departments were reporting number of arrests, these did not adequately describe the nature and extent of crime occurring in the nation’s cities and towns.

At their annual meeting in 1927, the International Association of Chiefs of Police (IACP) recommended the creation of a uniform set of crime statistics. The IACP argued that the availability of an objective and scientific counting of crime would provide the public with a more reasonable basis upon which to evaluate police performance (Rosen, 1995: 217). More importantly, according to Berkley California Police Chief August Vollmer, “… that statistics furnish a powerful means of discovering the causes of crime, provided they are used critically and carefully" (International Association of Chiefs of Police (IACP), 1971: 74). As a result, in 1930, the IACP published the first Uniform Crime Report (UCR). The FBI took over responsibility for the UCR report later that year and continues to publish the report annually. The report contains data on seven serious, commonly occurring, and commonly reported offenses including murder and non-negligent manslaughter, forcible rape, robbery, aggravated assault, burglary, larceny/theft, and motor vehicle theft. The IACP selected these crimes, known as the Crime Index offenses to serve as an index for evaluating fluctuations in the volume of crime. The number of these reported crimes, when collected annually and combined with population allows for the calculation of crime rates for a community and can present a more accurate or realistic picture of crime in a community.

If the core mission of the police is to prevent and solve crime, then crime

rates should be an important measure. Crime rates, recorded annually, would reflect the amount, as well as any increase or decrease in the amount of crime in a community. Unfortunately, the UCR system has several deficiencies inherit in the system that can impact the validity of the published findings. These are not fatal flaws, but they are issues with which anyone utilizing UCR figures needs to be aware (including the police, the media, researchers, or the public). One major issue is that UCR only reflects crime reported to the police. According to the FBI, the UCR reflects all actual and attempted offenses reported to an agency occurring within its jurisdiction for the reporting month (or crimes committed in previous months but not reported until the current month). However, other sources of crime data, including the National Crime Victimization Survey (NCVS), indicate that there is more crime occurring that what is reported to the police (Booth, Johnson, & Choldin, 1977; Biderman & Lynch, 1991). For example, one study found that less than half of all burglaries and robberies are reported to the police (Skogan, 1976). The reasons for not reporting crimes vary by crime type and victim. However, the bottom line is that UCR data do not accurately reflect all crime occurring in a community.

In addition to non-reporting, there are also issues related to missing and incomplete data. Users of UCR data should bear in mind that the UCR program is voluntary, with no legal requirement to report crime figures. Despite this, the UCR still covers most of the population of the United States. The coverage, which had been about 95%, did decline slightly (to approximately 87 percent) with the implementation of the National Incident Based Reporting System (NIBRS). However, as the FBI refines the reporting system, the FBI expects the coverage

to return to 95% coverage (Maltz, 1999). During 2003 (the UCR data used in this study), law enforcement agencies active in the UCR Program represented 93.0 percent of the total population and in coverage reached 94.6 percent of the population in 2007 (United States Department of Justice, 2007a). UCR is also limited to the seven index crimes and does not include several crime categories, including kidnapping, drug offenses, and white collar crimes. Excluding those crimes may give a different overall picture of crime in a community.

In addition to coverage deficiencies, there are also some methodological shortcomings with UCR that can lead to inaccurate estimations. When initially conceived, a major concern was the variations in crime definitions from jurisdiction to jurisdiction. To ensure the uniform reporting of data, the FBI developed a handbook for contributing law enforcement agencies that explained how to classify and score offenses and provided uniform definitions for the UCR crime offenses. As a result, agency report crimes as defined by the FBI versus their own state statutes and according to the FBI, most agencies make a good faith effort to comply with established guidelines (United States Department of Justice, 2007c). A more troublesome area is the potential shortcomings created by the UCR's "Hierarchy Rule," which the FBI instituted in the 1930s to prevent double counting of criminal events (Maltz, 1999: 14). The hierarchy rule essentially allows the police to report only the most serious crime in a criminal category. For example, if a criminal burglarizes a house and kills the resident while stealing property, the police would report the incident as a murder to UCR. Reporting standards included in the NIBRS system, first introduced in 1987, will eliminate this type of issue. However, the rule currently creates a situation where

certain crimes could be underreported. A final area of concern for UCR data involves incomplete data. Incomplete data can result from a variety of sources, including incomplete reporting, differences in crime definitions, errors, zero population agencies, and even delays in reporting. To minimize these potential problems, the FBI has developed a handbook for reporting agencies to ensure consistent reporting practices, has a data checking system, and can estimate totals base upon partials submissions. The end result is that, despite the best efforts of the FBI, UCR data can be uneven and care should be taken, especially when making agency level comparisons (Maltz, 1999).

Researchers need to be aware that the UCR data are only one source for community crime rates. In addition to the FBI's UCR, researchers can obtain crime rates from a number of other sources including the Bureau of Justice Statistics and their National Crime Victimization Survey (NCVS), as well as other survey-related studies. Whatever the source, crime rates can be a good and objective indicator of the amount of crime in a community. But this does not necessarily mean that the crime rate is a good indictor of the job the police are doing. The reality is that there are a multitude of agencies that share at least some responsibility for the amount of crime in a community. That list includes (but is certainly not limited to) the sheriff, the courts, including prosecutors, judges and court personnel, corrections, including probation, parole, jail and prisons, as well as social welfare agencies, school systems, the community and the family (Wadman & DeLadurantey, 1984: 227-228).

Despite the fact that the police are not solely responsible for the crime rate, its use as a measure of police effectiveness has a long-standing history. Indeed,

when created, one of the original intents of the UCR was to help the police defend themselves from critics who felt the police were doing nothing to stop rising crime rates. The hope was that the availability of an objective and scientific counting of crime would provide the public with a more reasonable basis upon which to evaluate police performance (Rosen, 1995: 217). However, as critics point out, policing is only one of a multitude of factors that can affect the crime rate (Dilulio, 1993). There are varieties of other factors that can affect crime rates, many of them outside the control of criminal justice system.

According to the FBI, in addition to policing strategies and activities, non-police factors such as population density, degree of urbanization, variations in composition of the population (particularly youth concentration), economic conditions (such as median income, poverty level, and job availability), cultural factors, and family conditions with respect to divorce and family may affect or influence crime. Beyond those, crime experts have identified a wide variety of additional factors that may influence crime and crime trends. Some of these go far beyond simple economic or personal factors and include social problems like teenage pregnancies and dropout rates (Kruttschnitt, Mcleod, & Dornfeld, 1994), abortion (Donahue & Levitt, 2001), the availability of guns (Zimring & Hawkins, 1997), the growth in gangs (Bjerregaard & Lizotte, 1995; Messner & Tardiff, 1986), drug use (Goldstein, Brownstein, & Ryan, 1992), medical technology (Harris et al., 2002) and even the media (Bushman & Anderson, 2001).

In many cases, the exact nature of the correlation is not clear, but research has established and recognized many of these factors for many years. For example, sociologists at the University of Chicago first described the link between

crime and urbanization at the beginning of the twentieth century. They found distinct differences based upon race and wealth and, regardless of their status in life, people were affected by the social environment in which they lived (Park, Burgess, & McKenzie, 1925). The social structure of crime theory views crime as the result of being in the disadvantaged economic class, with the social and economic forces operating in many deteriorating neighborhoods driving residents into criminal behavior (Siegel, 2006: 181). There is a variety of theories as to why this occurs. But, regardless of the actual causes, research establishing the link between economic conditions and crime is strong.

Researchers have consistently found a strong correlation between age and crime. Thus, the age composition of a community may also be a factor in local crime rates (Hirschi, 1969; Blumstein & Rosenfeld, 1998; Steffensmeier & Streifel, 1991). Regardless of economic status, race, sex or marital status, the research has consistently shown that young people commit crime more often than older people (Hirschi & Gottfredson, 1983). Communities with a greater percentage of youth can expect more crime than communities that are predominantly older. Research tying economic conditions (i.e., median income, poverty level, and job availability) to crime and crime rates is also plentiful and convincing. Indeed, most theories of crime include economic conditions as a basic cause of crime (Carroll & Jackson, 1983). There have been studies linking inequality or relative levels of economic deprivation to an individual's expected benefits of both legal and of illegal activity. Greater levels of economic deprivation limits access to legitimate means of achieving prosperity and motivates people towards illegal methods (Ehrlich, 1973; Lott, 1990). However, the impact of economics is not

limited to a rational choice theory of criminality. There have been a variety of theories that do not solely blame the individual, but instead place blame upon the system or society. In 1960s, several researchers suggested that it was a culture of poverty that existed in the slums which created an inescapable lifestyle. That lifestyle prevented members from developing the skills and habits necessary for social success and ultimately resulted in high unemployment, non traditional family structure and other characteristics linked to crime (Lewis, 1969; Myrdal, 1970). William Julius Wilson (1987) identified and described the plight of the lowest socio-economic class, a group he labeled "the truly disadvantaged." For Wilson, the issue is not simply cultural racism or en entrenched cultural of poverty, but joblessness reinforced by an increasing social isolation in an impoverished neighborhood that reinforces the social problems with which they must deal. Wilson also linked the economic conditions, breakdown of community cohesion, racism, and unemployment with crime.

Crime is not limited to the poor or minority groups. Several researchers have explored the link between cultures and violence. In some cases, subcultures develop with norms distinctly different from the dominant cultural. If violence is prevalent norm, the result can be what Wolfgang and Ferracutti (1967) called a subculture of violence. The result is people living in this subculture who would not have previously considered violence, now find violence an acceptable means to accomplish goals. Even friends and family play a role on crime. Many researchers believe that crime is learned behavior, and most criminals learn that behavior from friends or even families. This link between family, parenting and discipline with adolescent and even adult criminal behavior is one area that is well

researched (Goetting, 1994). While sociologists differ on the extent and the exact nature of the relationship, there does appear to be a link between crime and family conditions with respect to divorce and family cohesiveness (Rosen & Neilson, 1982).

The end result is that while crime rates may give an accurate representation of crime in a community, with which the police are tasked with handling, using crime rates as a measure of police performance may not be valid. There are a wide array of factors potentially influencing crime and crime rates, and many of those are well beyond the capability of local police to effect. The challenge for researchers is to separate out the effect (if any) attributable to policing strategies from the effect of this myriad of other factors on crime rates. Further complicating the matter is that all of these outside factors give the police political cover to fend off criticisms of their activities (Blumstein, 1996). To counter the concerns associated with using crime rates as an evaluation tool for the police, researchers and administrators developed other measures to assist in evaluating agency performance, each with advantages and disadvantages. Some other commonly used performance measures include arrest rates, response time, a variety of per capita measures, crime clearance rates, and percentage of arrests resulting in conviction.

The use of arrest-related figures is probably the oldest form of police statistics. Police administrators can easily determine arrest numbers and the numbers are not dependent upon the actions of other agencies. If a police department collects detailed arrest information, researchers can compare that data with census bureau categories of race and occupation and can be of value

as they examine the characteristics of offenders, as well as their social and economic condition (Rutledge, 1928; Mead, 1929). However, like other measures, they may not provide an accurate assessment of activity *results* (what performance management would define as outcomes) and are subject to manipulation by departments. The number of arrests is not an indicator of the quality of arrests. For example, police departments can institute crackdowns or zero tolerance policies that may result in significant increases in arrest totals, but have little lasting effect on crime rates, community safety, or sense of security. Conversely, decreases in arrests may actually be indicative of successful efforts.

The classic example of this was the New York City Transit Police and their efforts to stop graffiti on subway cars. For years, police made more arrests in an attempt to discourage vandals, with little effect on the amount of graffiti. However, when the transit authority instituted a new policy that included immediately cleaning and removing graffiti, frustrating vandals, the city was able to change the appearance of its subways dramatically. As a result, subways cars are almost graffiti free and vandalism arrests have declined significantly. In this case, high arrests rates were indicative of a failing policy, while declining arrest rates were associated with a successful one (Kelling, 1996: 29). This is also true of community policing, where the community expects the police to intervene in community problems before an arrest is necessary. Consequently, in some cases, arrests may be more indicative of inadequate police efforts. Ultimately, arrests rates may simply be the result of department policy and can vary between agencies. Small numbers of could indicate inactivity or negligence or might be indicative of a less aggressive policy. A relatively high number of arrests could be

evidence of aggressive, proactive policing or it might also indicate a department with a diminished or casual respect for constitutional rights of individuals (Millspaugh, 1937).

Another traditional measure of police effectiveness has been police response time. Police define response time as the time it takes the police to arrive on the scene of a crime from when the victim or witness first calls to report the event. The traditional philosophy is that timely responses to crimes increases the likelihood of apprehending the criminal (Report on Police, 1973). In recent years, a number of studies examined the effectiveness of quick responses and have generally found that there is little correlation between response time and crime clearance (Stevens, Webster, & Stipak, 1980). Despite the intuitive logic of speedy responses to criminal events, there are several reasons explaining the limited correlation between time to response to a crime and the solving of that crime. For example, in the majority of crimes, victims discover the crime after the offender has left. However, even with an in-progress event, research has found that the time it takes for the victim or witness to call the police is often longer than the police response time (Kansas City (MO) Police Dept, 1978). Research has found a variety of reasons for this delay in reporting, including ambiguity about whether or not a crime is actually being committed, first priority given to coping with problems the crime has created, conflict about whether or not to call the police, and no phone readily available (Spelman & Brown, 1981). The often-lengthy delay by citizens in reporting crime can negate any advantage associated with a fast response. Despite this, research continues to use response time to evaluate the police, although using it as a comparative measure may be

problematic. There have been suggestions that more appropriate measure would be to use customer satisfaction with response times as a performance measure (Hatry, 1999; Maguire, 2007).

In addition to these "traditional" measures of police performance, researchers and practitioners have developed a series of efficiency-oriented measures. These measures, which are based on budgeting principles, quantify the relationship between inputs and outputs or outcomes and are measured by indicators of the resources used or cost per unit of output or outcome (*Performance Measurement for Government*, 2007). The general goal is to maximize outputs at minimal cost or using minimum resources. Examples of this type of measure include cost per crime cleared or assigned, or hours expended per crime cleared (Drebin & Brannon, 1992).

Related to efficiency measures are budgeting and staffing norms, often expressed as a per capita measure (i.e., police officers or budget dollars per capita). Researchers and administrators can easily derive these numbers by simply dividing the number of police officers or budget by the jurisdiction's population. According to Wadman and DeLadurantey (1984), the resulting measure is a relative efficiency number that allows for comparisons across time and across jurisdictions. However, like crime rates, improperly comparing or interpreting per capita measures can lead to misleading and deceptive findings (Hatry, 1999). Theoretically, per capita measures allow for the comparison of similar jurisdictions, or the same jurisdiction overtime. The simple (and often misleading) interpretation is that the higher per capita cost, the less efficient the agency. Researchers, administrators, and citizens need to be cautious when

making simple comparisons and recognize that there may be legitimate reasons for variations in per capita costs or staffing. For example, differences in enforcement policies, political culture, and demands of the citizens could all resulting dramatically different per capita levels.

An issue with nearly all of these measures is there are a wide variety of other (non-police related) factors influencing them. This has left researchers and practitioners looking for a more direct measure of the quality of work an agency is producing. Clearance rates and percentage of convictions obtained are both measures of police activity that meet this need and are less dependent upon community and social factors. Clearance rates are the percentage of reported crimes solved by the police and appear to be "a slightly more discriminating barometer of police efficiency" (Wadman & DeLadurantey, 1984: 228-229). Although Wadman and DeLadurantey misidentify clearance rates as an efficiency measure when it is actually a measure of effectiveness, their point is valid and clearance rates are a good measure of police effectiveness. This study uses clearance rates and discusses their advantages and disadvantages in the next section. The percentage of conviction obtained is another measure of police activity, focusing on the criminal investigation, evidence collection and processing, and court testimony. Unfortunately, as with other measures discussed, the percentage of investigations resulting in a conviction is not entirely dependent upon the police. The efforts of prosecutors, prosecutorial policy, and skill of defense attorneys will all impact convictions. Changes in conviction rates may be a better measure of judicial effectiveness versus police effectiveness.

The Use of Crime Clearance Rates

The intent of this study is to examine police agencies and the quality of work they perform. To help ensure applicability and generalizability, this study needs to use a common measure that would most closely reflect the level or quality of work that the police are performing. Accordingly, this study uses clearance rates for crimes reported to the police. This selection of clearance rates assumes that a core function or aim of law enforcement is to solve the crimes reported to them. Using clearance rates as a measure of police activity is valid because clearance rates measure (at least one facet) of what the police actually do. Clearance rates are a nearly universal output measure that is almost entirely dependent upon the police and their actions.

Researchers, practitioners and citizens generally agree that clearing crimes is a positive and desirable output (Wadman & DeLadurantey, 1984; Leggett, 2002). Clearing reported crimes helps to fulfill one of the core missions of the police, apprehending offenders. However, it can also contribute to the crime prevention mission. A 1985 study looked at the relationship between clearance rates and crime rates. This study considered the seven UCR Index crimes and found a link (albeit weak) between clearances and robbery rates. That is, as clearance rates increased, the robbery rate decreased (Sullivan, 1985). These findings were consistent with deterrence theory: as the police solve more robberies (presumably making more arrests), potential robbers recognize the increased risk and opt away from committing robberies. The link was weak but supported general deterrence theory (Van Den Haag, 1982; Wilson, 1975).

There have been some criticisms of crime clearance statistics. Since there

inception, critics have been concerned that clearance rates may not be comparable across agencies. For researchers, perhaps Josiah Stamp summed up the greatest concern best with this caution about official statistics:

> The individual source of the statistics may easily be the weakest link. Harold Cox tells a story of his life as a young man in India. He quoted some statistics to a Judge, an Englishman, and a very good fellow. His friend said, "Cox, when you are a bit older, you will not quote Indian statistics with that assurance. The Government are very keen on amassing statistics – they collect them, add them, raise them to the nth power, take the cube root and prepare wonderful diagrams. But what you must never forget is that every one of these figures comes in the first place from the chowty dar [village watchman], who just puts down what he damn pleases." (1929: 258)

In addition to the accuracy of the original source of the statistics, critics have cited several other areas of concern regarding crime clearance statistics. These concerns include variations in the methods of recording and classifying reports of offenses, the unwillingness of departments to report all the offenses known to them, and the lack of uniformity in the laws and administrative practices throughout the country (Parratt, 1938; Ammons, 1996; Maltz, 1999). The collectors and users of these statistics have addressed many of the deficiencies, which critics have pointed out since the infancy of clearance statistics. As a result, according to Paré and Ouimet (2004), researchers and administrators frequently use and accept crime clearance statistics.

Because clearance rates are a reflection of a police agency's quality of work and research has linked them to positive outcomes, researchers frequently use them. Drake and Simper (2003) examined a variety of output measures from a sample of previous studies as part of their evaluation of inputs and outputs in effectiveness measures of police forces. While many of those measures were

unique or specific to a particular study, nearly every study used clearance rates, further supporting the police function and crime clearance assumption. Drake and Simper (2005) later used the crime clearance as an output in an analysis of English policing units. Smit et al., (2003) also found that clearance rates (also known as clear up rates or detection rates) can be a valuable measure and do tell something about the effectiveness of police crime investigation activity. Moore and Braga (2003a: 39) found clearance rates to be a valuable (if underutilized) measure of police effectiveness because "it reveals the effectiveness of police patrol, rapid response, and investigative activities in solving crimes and apprehending offenders." Researchers and analysts often prefer to use clearance rates over the use of arrests rates because agencies can more easily manipulate arrest statistics and there may be an perverse incentive for the police to make arrests without sufficient probable cause, knowing the charges would likely be dismissed by the courts (Diez-Ticio & Mancebon, 2002: 354).

However, the use of clearance rates is not without issues and there have been several concerns about the validity of their use. A major concern is that clearance rates may not be very accurate. In many instances, clearance rates can be either artificially improved or they can be misleading low. Departments can improve clearance rates by persuading offenders who are guilty of one crime to confess to other (previously uncleared) crimes with the understanding that the police will charge the offender with only the original crime. Conversely, the police may be content to file charges against an offender that will guarantee an effective prosecution, and not make any additional effort to find out whether that offender committed other offenses. Another reason the numbers may not particularly

accurate is that they reflect a police department's policies and judgments, rather than real information about how many crimes are going unsolved. According to Moore and Braga (2003a: 40), it is the rare police department that will make a serious effort to investigate, solve, charge, and prosecute offenders for all the crimes they might have committed. Most focus their efforts on solving easiest cases or on case for which there is a lot of public pressure to solve. Finally, the best evidence of whether the police have cleared a crime may not whether the police think they solved the crime, but whether a prosecutor, a court, and a jury think they have. Ideally, case clearance would require a conviction, however previously discussed problems with using court convictions make that an impractical measure.

Despite the fact that scholars often criticize clearance rates, law-enforcement and governmental agencies continue to use clearance rates to assess police performance. A main weakness of the arguments proposed by critics is their general inability to formulate credible and usable alternatives to clearance rates, explaining why these measures are still popular despite their well-known issues (Paré & Ouimet, 2004).

When looking at police agencies' clearance rates, the most common source of clearance statistics has been to use the FBI's Uniform Crime Report (UCR). The FBI collects crime statistics from more than 17,000 city, university and college, county, state, tribal, and federal law enforcement agencies, making it the most comprehensive source of crime statistics in the United States (United States Department of Justice, 2006a).

This study examines clearance rates for seven offense categories. These

crimes include the violent crimes of murder (including non-negligent manslaughter), forcible rape, robbery, aggravated assault, and the property crimes of burglary, larceny-theft, and motor vehicle theft. These are the UCR Part I offenses and are serious crimes and/or frequently occurring crimes. While these categories do not cover all crimes investigated by the police, they do cover common or street crimes all police departments investigate. Researchers have used UCR data for more than 75 years to examine and compare overall crime and crime rates (United States Department of Justice, 2007b).

In an attempt to create a single measure or indicator of crime in a community, the FBI used these seven crimes as the basis of the Crime Index, created in 1960. The FBI calculated the Crime Index by simply totaling the crime rates (crimes per 100,000 inhabitants) for the seven Part I offenses. While relatively simple to calculate, the index was persistently criticized because it did not take into account the varying seriousness of the crimes, weighting a larceny of a bicycle the same as a murder (Blumstein, 1974). With property crime rates generally seven to ten times larger than violent crime rates, minor changes in a property crime rate could mask a significant change in violent crime rates. Similarly, because the number of property crimes is typically disproportionably larger than the violent crimes, the measure might be misleading in communities with a high number of property crimes, but minimal amount of violent crime. Although there were calls for a system of weighting crimes, at the recommendation of the Criminal Justice Information System (CJIS) Advisory Policy Board (APB), the FBI discontinued publishing the Crime Index in 2004 because the Crime Index “has not been a true indicator of the degree of

criminality" (United States Department of Justice, 2006a). The FBI continues to publish a total violent and a total property crime statistic, as well as rates for the individual crime categories.

The FBI also collects basic arrest information for the index crimes, including age, gender, and race of the offender. In addition to collecting arrest data for index crimes, the FBI also collects arrest information for 22 other crimes, including minor assaults, Driving Under the Influence (DUI), kidnapping, white collar crimes, drug offenses, vice crimes, vagrancy and disorderly conduct, as well as arrest data for an "all other offenses" category and "suspicion" category. The "all other violations" category includes arrests for any state or local laws for which the FBI does not specifically collect arrest information, except traffic violations. The suspicion category is the number of persons arrested for no specific offense and released without formal charges. As part of the arrest data, the FBI also collects information about the number of curfew and loitering law violations, which is the number of violations by juveniles of local curfew or loitering ordinances and the number of runaways (persons under age 18) taken into protective custody under the provisions of local statutes.

The data for these additional crime categories, known as Part II crimes, are limited to the number of arrests and basic offender data, which includes the age, gender, and race of the subject arrested. The FBI does not collect number of Part II offenses reported or any clearance statistics. This is because Part II crimes are either reported much less frequently (for example, kidnapping) or the number of arrests closely approximate the number of incidents, since the incident usually results in an arrest, such as in DUI or drug offenses (Paré, Felson, &

Ouimet, 2007). For many of these types of crimes, the number of arrests may be more a measure of police initiated activity than effectiveness. The number of arrests for some of these crimes may not be representative of the amount of crime actually occurring in a community. For example, gambling, liquor offenses, prostitution, public drunkenness, DUI or drug arrest numbers can reflect policy demands, with numbers increasing or decreasing as department priorities change. However, those numbers may not reflect changes in the actual amount of crime occurring and in some cases, can be manipulated by police (such as making arrests knowing that there is insufficient probably cause, likely resulting in the case being dismissed by the courts). Additionally, Part II crimes represent minor crimes (such as vagrancy, curfew or liquor law violations, disorderly conduct, or vandalism) where police would have a great deal of discretion in handling the case and where, in some cases, arrests may not be the most desirable outcome. Because of these issues, the FBI only collects information on these Part II crimes when the police make an arrest. These data still allow for comparisons and trend analysis and can be useful for researchers as they examine crime in a community, region or across the nation.

For reasons previously discussed, the arrest data associated with Part II crimes are not well suited for evaluating police performance. Conversely, Part I crime statistics, which includes the number of offense reported and the number of those offense cleared by the police, does allow for some measurement of police services. Part I crimes cover the more common crimes involving violence or theft and represent crimes commonly reported to the police by citizens and are crime that citizens expect (require) police intervention. Although there have been some

concerns expressed about possible flaws in the UCR system (Chaiken, 1975; Skogan, 1975), they are a frequently used measure by both decision makers and scholars (Paré & Ouimet, 2004; Reiner, 1998). In recent years, the FBI has addressed many of those potential flaws and others have been found to be not as problematic as originally thought (Maltz, 1999).

If investigating crime is a core mission of law enforcement, then clearance rates are a good output measure. To clear a crime for UCR reporting purposes, either the agency can make an arrest to present that subject to the court, or they can clear it by exceptional means. An exceptional clearance requires that the police identify a suspect and have enough evidence to arrest, but circumstances prevent the agency from making the arrest (United States Department of Justice, 2007b). Typical exceptional clearances involve uncooperative witnesses/victims, the denial of extradition, or a suspect who has died. Exceptional clearance allows investigators to clear crimes even if they are unable to make an arrest provided that the investigation identifies a suspect with the standard of proof required to make the arrest. This make clearance rates a better indicator of investigative effectiveness than arrests alone, since it more accurately reflects the number of crimes the police have solved.

Conducting Criminal Investigations

When looking specifically at the police's criminal investigation function, there has not been an abundance of research. One of the possible reasons for the lack of research may be the RAND Corporation's 1975 study of the criminal investigation process (Greenwood & Petersilia, 1975). In their three volume study, researchers found that police tactics, methods, staffing, training and

procedures all had no effect on clearances rates, crime rates or arrest rates (Greenwood et al., 1975). The researchers concluded that the solved cases were essentially “self solving” meaning the cases that were usually solved had suspects who could be identified by witnesses or victims and investigators did little work that actually led to clearances. Most of their work was obvious and routine tasks that could be performed by clerical personnel (Greenwood et al., 1975: 82-83).

In response to the findings of both the RAND study and President Johnson's Crime Commission and Administration of Justice Report, in the 1976, the Law Enforcement Assistance Administration (LEAA) began looking for ways to address the perceived inadequacies of police investigations. Key to their efforts was the development of a system for better managing criminal investigations with the ultimate goal of improving the success of those investigations. The goal of the program, termed Managing Criminal Investigations (MCI), was to help law enforcement agencies more effectively manage criminal investigations (Greenberg & Wasserman, 1979; Bloch & Bell, 1976). In addition to the preliminary and post-investigative processes (working with the district attorney’s), the program also focused on case screening, reassignment/decentralization of detectives, and the management of ongoing and follow-up investigations. Although the MCI program was popular with agencies that implemented it and elements of the program were effective, overall the program results were ambiguous and inconsistent. In many cases, evaluations of the programs were vague and ambiguous because of variations in program implementation and evaluation among the various sites (Regan, Nalley, & White,

1979).

Although the LEAA Managing Criminal Investigations efforts were not hugely successful, they did identify several important processes and tactics that could positively affect criminal investigations. The MCI program emphasized the importance of expanding the responsibilities of patrol officers in the investigative process, with improved initial investigations and case screening, and using solvability factors to screen "unsolvable" cases. The MCI program also recommend the development of "performance anchors" and better methods to account for detectives' time and activities (Wycoff, 2001).

With this groundwork, scholars and practitioners began to identify a variety of factors that influence the criminal investigation process. Bloch and Bell (1976) found that improved preliminary investigation and case screening led to improved clearance rates. An initial investigation (the term initial is preferred to preliminary since preliminary infers that there will be a subsequent investigation) is the investigation conducted by the first responding officer (typically a uniformed patrol officer). The initial investigation involves determining the nature of the offense, the identification and interviewing of potential witnesses, as well as the victim. The first responding officer may also conduct a search for physical evidence. Very often, departments use the results of the initial investigation to determine if investigators should continue investigating (Greenwood et al., 1975).

In some departments, the initial investigation identifies characteristics of the offense, known as solvability factors, that allows investigators to determine the likelihood of successfully solving the crime. Solvability factors include elements the first responding officer can easily assess and document, often in the

form of a report checklist. Solvability factors can include the presence of a reliable witness, identification of the suspect by the victim or witnesses, the theft of traceable property (that is, items with serial numbers or other identifiers), a crime with a significant *modus operandi* (MO), the presence of useable physical evidence, or a crime with limited opportunity for anyone other than suspect to commit (Brown, 2001: 60). The more of these "solvability factors" that are present, the more likely that investigators may solve the offense with reasonable additional investigative effort. Utilizing solvability factors and concentrating efforts on cases that investigators are most likely to solve, departments can focus on their resources in a most productive manner (Greenwood et al., 1975: 10).

Around the time of the development of the MCI program, Weagel spent nine months observing a city detective division and their case handling process. He looked at detective caseload as well as bureaucratic requirements and found caseloads and perception of the cases were critical in determining how the cases were investigated. Weagel (1981) found that not only did caseloads load effect investigative effort, but the investigators perception of whether the case was routine or not could affect how vigorously the case was investigated. Weagal also found that many of the detectives believed their superiors based their evaluations and promotions on the number of arrests made, so they sometimes engaged in a practice called "skimming." Skimming involves selecting the easiest cases in the workload based on the original report and focusing all efforts on those (to the exclusion of the rest of their cases). Weagal (1981: 274) also found that as caseloads increased, detectives begin assuming stereotypical outcomes of efforts rather than actually pursuing leads. That discretionary latitude seemed

to confirm findings in volume II of the RAND study that as department caseloads increased, arrests decreased (Chaiken, 1975).

Despite the RAND Corporation's findings, which seemed to imply that there was little or nothing a police agency could do to enhance the investigative process, there were a few studies in the 1970s and 80s that looked at the investigative process and examined why investigators solved some crimes but not others. Several found that agency activities could affect investigative effectiveness and that investigators did play a more important role than the RAND study suggested (Bloch & Weidman, 1975; Eck, 1983). However, the research also makes it clear there are a variety of factors outside the police department that impact agency effectiveness and that researchers and administrators cannot ignore when assessing that effectiveness.

For example, Sanders (1977) found police organization characteristics such as their size and community demographics may be related to their ability to generate and access information which can improve crime solving. Swanson (1978) looked at arrests and arrest rates and how they were influenced by a variety of environmental and organizational factors. She hypothesized that there is a relationship between organizational and environmental factors and the rate at which some police departments initiate the criminal process with an arrest. Swanson suspected that certain organizational characteristics, such as the degree of centralization, specialization and professionalism, would correlated to higher arrest rates for order maintenance and victimless crimes. She hypothesized that more centralized and specialized agencies (operationalized by the number of police stations and number of officers assigned to specialized

units) would exercise more control over officers, limiting their discretion, and that limit would be evident in numbers of arrests. Looking at a variety of organizational measures across the seven index crimes, Swanson found that there were some correlations, but they were weak and inconsistent and she could draw no strong conclusions. However, there were a variety of environmental factors (such as percentage of non-white, income inequality and number of 15 to 25 year old males) that were more influential than organizational factors in invoking the process, as demonstrated with arrest rates.

Other studies looked at victim characteristics and police expenditures and their impact on investigative effectiveness. Bynum, Cordner and Green looked at the investigative process and the decision to investigate. While there is some research into discretionary issues like a street-level police officer's decision to arrest or the victim's decision to report, they found relatively little research into the police decision to investigate. While the decision for an officer to base his or her arrest upon available evidence or a the presence of a witness seems intuitive, this study found that victim characteristics did influence the decision to investigate. In particular, burglary cases in areas with higher median incomes often received more investigative effort (Bynum, Cordner, & Greene, 1982). Another study found that gender and race, particularly of the victim, played a role in the decision making process, with females and nonwhite victims receiving less attention from investigators (Smith, 1987). However, overall the findings have been mixed, with some studies finding that race did appear matter (Decker, 1981; Benson, 1981; Brown & Coulter, 1983; Huang & Vaughn, 1996), but others finding that race alone was not a significant factor (Brandl, 1993; Kusow, Wilson, & Martin, 1997;

Jesilow, Meyer, & Namazzi, 1995; Frank et al., 1996).

Several studies have looked at the relationship between police inputs (enforcement efforts) and outputs. Cloninger and Sartorius analyzed this relationship, using officers per capita and budget expenditures and found that for small increases, the results were not significant. However, for large increases, there was a small increase in both clearance and crime rates. The implication is that while not generally effective, large increases in police expenditures could impact clearance and crime rates (Cloninger & Sartorius, 1979).

The research into the specific effect of police agency size on crime clearances is sparse. Volume II of the RAND Corporation's report on the criminal investigation process, entitled Survey of Municipal and County Police Departments, examined some organization factors including agency size and number of investigators and their effect on effectiveness. Using a survey of 300 large police departments (more than 100 officers) and UCR data, they did find several significant department characteristics, including region and crime workload, correlated to crime clearances and arrests. The analysis found that larger departments cleared more crimes per arrest than smaller departments, but found no evidence that larger departments cleared more crimes than smaller departments. The study offered several possible explanations for the higher clearance to arrest ratio, including that larger departments were solving more serial crimes, smaller departments were making more fruitless arrests (arrests unrelated to a crime) or possibly just a records keeping difference (Chaiken, 1975: 39). The RAND study also found that as the crime workload (crimes per officer or investigator) increased, arrests decreased. These findings were

consistent with the belief that by adding police officers, a department can increase the number of arrests, decrease the crime rate or both (Chaiken, 1975: 41) although clearance rates were not as sensitive to workload changes as arrest rates.

A 1970 study by Willmer found an inverse relationship between agency size and clearance rates, with smaller departments clearing a larger percentage of crimes. However, he found a strong correlation between environmental characteristics and agency size, indicating a stronger link between community characteristics and clearances than the link between some departmental characteristic and clearances. Willmer theorized that smaller departments operate in smaller communities, where there are fewer crimes and a greater sense of community and cohesiveness, increasing the likelihood of the police receiving citizen cooperation (Willmer, 1970: 22). Sanders (1977) also theorized that smaller agencies have lighter caseloads, allowing investigators to dedicate more time to investigations.

A more recent study looked at homicide clearances and examined the impact of more than 200 potential factors or characteristics, which could affect clearance of the crimes. Wellford and Cronin (1999) looked at nearly 800 homicides (74% of which had been cleared) that occurred in four large U.S. cities in 1994 and 1995. The findings confirmed several case specific characteristics that made it more likely investigators would solve the case, including the presence of witnesses, the suspect was a minority, or the case was not a drug-related killing. More useful were the findings related to factors that the police can control. Of the 51 factors identified as being significant, 37 were associated with

police practices. The study found the initial scene investigation was important. Actions by first responding officers, including securing the scene to identify potential witnesses, protect evidence, as well as conducting neighborhood canvasses, all improved the likelihood of clearing the crime. For investigators, the timeliness their response and that of the crime scene technicians was also significant, as was the number of investigators assigned to the case. The study found the assignment of three or four detectives was optimal for clearing a case, but that increasing that number is not efficient until one reaches very large numbers of detectives (that is, 11 or more), which also improved the likelihood of solving the crime (Wellford & Cronin, 1999: 63). Several other police or investigative related activities were also significant, including conducting computer checks on suspects, weapons, and victims, taking detailed crime scene notes, interviewing, and following up on all witness information. While this study was limited to four agencies and looked only at homicides, the implications are important. Most importantly, the study seems to infer that the actions of the police do contribute to the likelihood of solving the crime, contrary to the findings of the RAND Study.

The one study that did look directly at the impact of police agency size on investigative effectiveness was Cordner (1989). His study actually contained two separate analyses. The first analysis used aggregated UCR data to examine national level trends. Cordner, like many others who included agency size in their studies, used city size (rather than agency size). Using population, he did find a relationship between size and effectiveness, with clearance rates increasing as city size decreased. The notable exception was cities under 10,000, which had

lower clearance rates than the next three larger city size groups. The UCR analysis used city size, not department size, but Cordner argued that the link between city size and agency size would be so strong that comparing agency size would show no significant difference.

Given regionalization, contracting and intergovernmental agreements, community size may no longer be a good proxy measure for agency size. One obvious area of concern, for instance, would be small communities that may opt to receive their police services from a larger nearby agency, such as a sheriff's office, county police, or intergovernmental arrangement with a nearby municipal police department. This could include small rural communities, but also some more densely populated urban municipalities that contract for services from other nearby jurisdictions. In Los Angeles County, 40 of the 88 incorporated cities contract for police services through the County's Sheriff's Department (LASD) in an arrangement known as the Lakewood Plan (Los Angeles County Sheriff's Department, 2007). These cities range in size and demographics from the rural waterfront town of Avalon (on Santa Catalina Island) to more densely populated and urban communities like Compton (which operated its own municipal police department until 2000) and Inglewood, all getting police services from the nearly 9,500 sworn officers of the LASD. Considering these examples, using city population as a proxy for agency size does not appear to be appropriate.

As part of his 1989 study, Cordner conducted a separate agency size analysis using data limited to the State of Maryland that included municipal departments, as well as county police and sheriff's offices. That analysis found several factors other than agency size to be significant, but the impact of agency

size was not conclusive. The region variable once again was important, with police in the Baltimore and Washington DC metropolitan area tending to have lower clearance rates. He did find that bigger departments in metropolitan areas achieved greater investigative effectiveness (as measured by clearance rates) than smaller departments from that region. However, the reverse relationship was found in non-metropolitan areas, with smaller agencies achieving higher clearance rates than larger ones. Overall, the study's finding on the impact of agency size were inconsistent and inconclusive. Cordner admits that the sample itself may be part of the problem, with a relatively small sample that included several large county agencies who serve primarily suburban areas. This may not be typical of law enforcement in the United States where larger departments typically serve large urban cities (Cordner, 1989: 152). Cordner did find evidence that caseloads affect clearance rates, with increasing caseloads linked to lower clearance rates, supporting the strain or workload theory that links decreasing clearance rates to caseloads.

One final study of value in understanding the role of agency size is James Q. Wilson's look at policing in eight communities, six in New York: Albany, Amsterdam, Brighton, Nassau County, Newburgh, and Syracuse, plus Highland Park, Illinois, and Oakland, California. Wilson studied how patrol officers deal with such common offenses as assault, theft, drunkenness, vice, traffic, and disorderly conduct and found an interesting pattern for the arrest rates of certain crimes. He found that while smaller suburban police agencies have higher arrest rates for breaches of the peace, a nearby (larger) county agency had comparatively higher arrests rates for theft. Wilson hypothesized that the smaller

agencies were more responsive to residents who would emphasize crimes that threaten the peace of those communities, such as a breach of peace. Community pressure would change the policing emphasis, resulting in higher arrest rates for more visible (but somewhat less serious) crime of breach of peace. However, larger agencies, who are (theoretically) less susceptible to community pressure, would emphasize crimes with a higher cost to the community, such as theft. As a result, the larger department with its investigative specialization would have higher rates of arrests for thefts (Wilson, 1968).

Despite the RAND Corporation's claim that traditional investigative techniques do not affect crime clearance rates (Greenwood & Petersilia, 1975), there is evidence that a variety of factors do have some influence on criminal investigations and why some crimes are solved and others not. The one specific area not extensively studied appears to be the impact of police agency size on investigative effectiveness. The research in this area remains divided and inconclusive and Skogan and Frydl (2004: 173) warn against making policy decisions based on this "modest body of research."

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

As noted previously, the goal of this study is to measure the association between police agency size and the ability of an agency to solve or clear crimes. Because of the fragmented nature of policing in the United States, there is a multitude of police agencies supplying services, ranging in size from very large (more than 10,000 sworn officers) to extremely small (one or fewer full-time officers). As a result of this, there has been an ongoing debate as to whether the size of a police agency affects its ability to deliver services to its customers. Proponents of larger agencies have suggested that larger agencies can take advantage of their increased manpower and resources, combined with factors such as economies of scale, to produce higher quality police services. Others argue that smaller agencies can be more responsive to community demands and the high degree of specialization that proponents of larger agencies believe is important may not be necessary to provide effective police services. Since the 1970s, the debate has continued with research providing little in the way of conclusive evidence.

Determining what makes a more effective police agency is admittedly a complex and difficult task. Modern police forces provide a wide variety of services, often going far beyond the traditional crime prevention and crime solving roles. A renewed emphasis on community policing and problem solving has changed the focus of many agencies and their mission. Furthermore, the nature

of the mission can vary between agencies, with communities often expecting (requiring) different levels and types of services. These differences can further complicate comparisons. This study will focus on the one, nearly universal aspect of the police mission: solving crimes reported to them. Using FBI crime statistics, this study will examine the relationship between the size of a police agency (total sworn and non-sworn personnel) and the rate of crime clearance for the seven index crimes (murder, rape, robbery, aggravated assault, burglary, larceny, and auto theft).

Research Hypotheses and Operationalization

The primary research question motivating this study is as follows: Does the size of a police agency positively correlate to the effectiveness of the services it provides, as measured by crime clearance rates? Figure 1 illustrates a general model of factors influencing police organizations and their effectiveness. The model assumes that there are several generally agreed upon outcomes for police agencies. This study proposes to examine a very narrow portion of the larger model by focusing on agency size and its relationship to the clearance rates of reported crimes. More specifically, the study tests the research hypothesis that larger agency size (the independent variable) correlates positively with greater clearance rates (the dependent variable), holding all other factors constant. Larger agencies would be better able to take advantage of staff and staffing levels, handle more investigations, and develop expertise, increasing the likelihood of clearing cases.

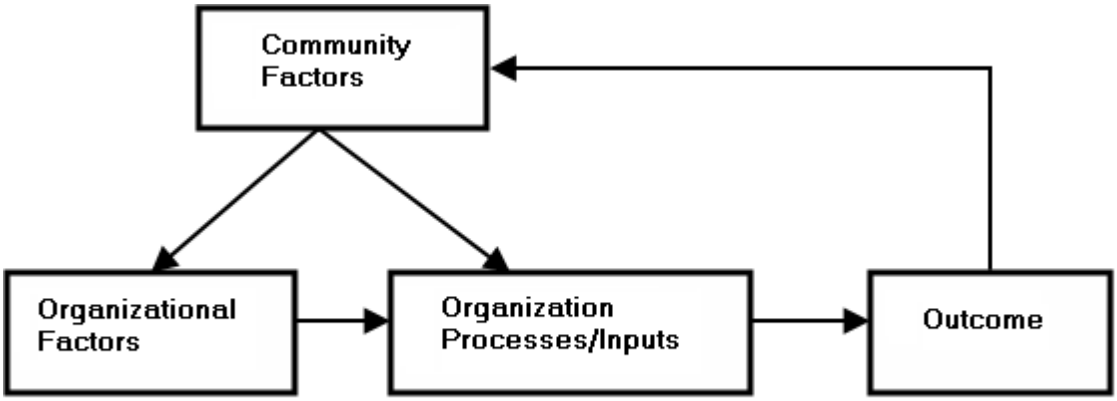

FIGURE 1: Causal Model

To explore the relationship better, the analysis uses multiple measures of agency size. Although there are a limited number of studies that have examined police organizations (Maguire, 2002), researchers typically use one of several variables to measure the size of an agency. Frequently, researchers use the most obvious measure of agency size, the number of sworn police officers in an agency. Another related variable is the total number of employees. This would include sworn officers as well as civilian or non-sworn employees. These personnel figures are the most commonly used measure of the size of agency. However, there are other possible measures of size including officers per capita, total budget and expenditures (Maguire & Schulte-Murray, 2001). This study examines the relationship between clearance rates and the number of total employees as well as the total number of sworn officers. The agency sizes (both sworn and non-sworn employees) are available from several sources, including the annual UCR submissions, the Census of State and Local Law Enforcement Agencies (CSLLEA) for 2000 and the Law Enforcement Management and Administrative Statistics (LEMAS) survey.

The study's dependent variable is percentage of Part I crimes cleared. There are eight crime categories that police report to the FBI as part of the annual UCR report. These categories include murder, rape, robbery, assault, burglary, larceny, vehicle theft, and arson (United States Department of Justice, 2004). Because of the unique nature of the crime of arson, the UCR Program provides a separate reporting form for collecting arson data. Due to the limited reporting of arson offenses by law enforcement, arson related data are limited and are not included in certain UCR data presentations (United States Department of Justice, 2003: 61). Because of limited data and the nature of arson investigations (i.e., arson investigations are typically conducted by the fire department or fire marshal's office), this study does not include arson in the analysis. The study will examine the percentage of the other seven crimes cleared by the police. To calculate the clearance rates, the analysis uses the number of each type of crime cleared divided by the total number of crimes reported, generating a proportion score between zero and one. Multiplying those scores by 100 yields the percentage of reported crimes cleared. The FBI collects and reports both total crimes reported to the police by type and number of those reported crimes cleared by the police for all Part I offenses.

The study hypothesizes that the relationship between agency size and clearance rate is positive, but it is not necessarily a linear relationship. Figure 2 illustrates the theoretical relationship between the size of a police agency (on the x-axis) and the percentage of crimes cleared (on the y-axis). The relationship curve starts with a relatively level slope. This level slope represents the approximate percentage of crime that any department would solve, even with no

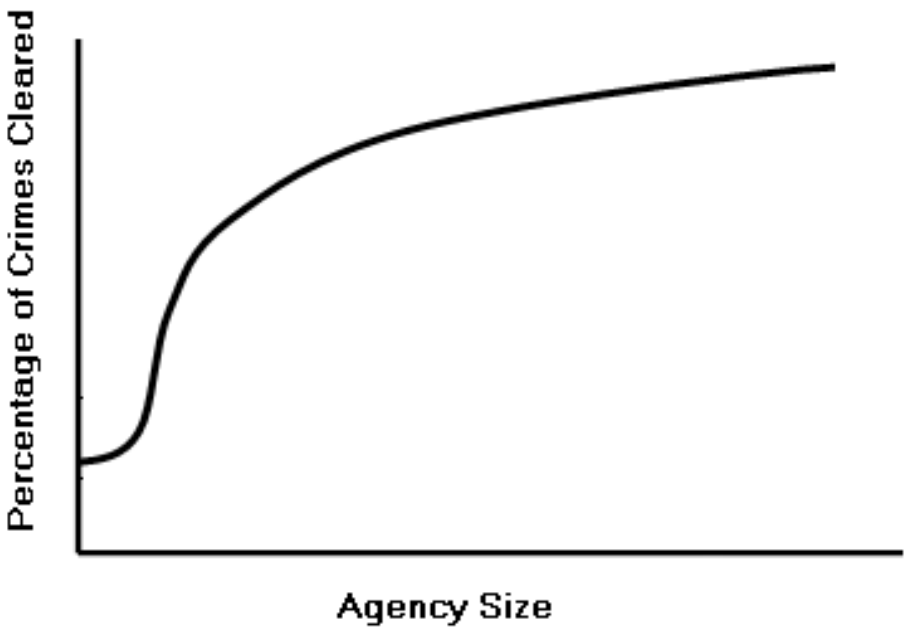

FIGURE 2: Theoretical Regression Curve

investigative effort. According to several studies, including the RAND study, a percentage of crimes are easily solved because the victim or a witness knows and can identify the offender (Greenwood & Petersilia, 1975). Regardless of the investigative effort, an agency would expect to clear a percentage of cases, although that percentage would vary by crime type. If agency size were not a factor at all in crime clearances, the relationship would be linear with a flat slope equal to the nationwide average percentage of crimes solved.

This study hypothesizes that larger police agencies will exhibit greater investigative effectiveness, resulting in a greater percentage of crimes cleared. Smaller police agencies would be less effective, clearing a smaller percentage of the crimes reported to them. There are several theoretical reasons this should occur. First, small agencies are going to have to dedicate most (if not all) of their staff to the patrol function and handling calls for service. Simply providing 24-

hour coverage requires at least five officers and departments with less than five will have gaps in patrol coverage (Galliher, Donovan, & Adams, 1975). Agencies with less than ten officers would still struggle to provide 24-hour patrol coverage with two officers. The result is that nearly all of the officers in small agencies tend to be "generalist," with most conducting a variety of functions, including patrol, service functions, education, crime scene processing and, when duties require or time permits, investigations (Falcone, Wells, & Weisheit, 2002). Because of the constraints on officers, these agencies would solve only the most easily solved crimes, based on solvability factors discussed earlier.

As agency size increases beyond the size needed to provide minimal patrol coverage, the department will be able to solve a greater percentage of crimes. This is because the increasing agency size would allow for the dedication of staff to the investigative function (e.g., detectives and investigators). This is where the slope of the curve shown in Figure 2 increases sharply upward. The addition of full-time investigators would increase clearances, even if they perform only the modest investigative duties described in the RAND study since they (the investigators) can commit all of their on duty time to those functions. This increasing slope would continue as departments take advantage of its dedicated investigative staff and specialization and clear a greater percentage of crimes reported to them.

Larger agencies can dedicate personnel to the investigative function, as well as adding dedicated staff to functions that would support investigations. This might include staff dedicated to analysis, crime scene processing, forensics, and intelligence gathering. Each of these functions would increase the likelihood of

clearing crimes. Additionally, as a department adds dedicated investigative staff, those investigators can specialize, allowing them to develop expertise in the investigation of their particular crime. Most large departments break down investigative staff to sub units such as homicide, rape, robbery, drug enforcement, and burglary investigators. This arrangement allows to departments to be flexible and adjust priorities and services as crime and community demands change. In recent years, many larger agencies have added specialized investigative units for domestic violence, computer crimes, fraud, street crimes, and some have even further specialized investigators to particular victim population groups such as homeless and immigrants populations. With each of these, assigned officers can develop expertise and knowledge more fully, enhancing their ability to investigate crimes successfully.

As agencies continue to increase in size, they would continue to improve their clearance rate. However, the incline of this curve would start to decrease as the crimes remaining unsolved become more challenging and difficult to solve. These more difficult investigations would require more than lead follow up and paperwork handling described in several studies describing the investigative process (Greenwood et al., 1975; Bloch & Bell, 1976; Swanson, 1978; Waegel, 1981), though theoretically the police could solve even the most challenging cases if enough staff and time could be committed to the investigation. Absence any mitigating factors, additional staff should result in clearing a greater percentage of reported crimes. This results in the curve in Figure 2 continuing to flatten out as it approaches 100% of crimes cleared.

Theoretically, any agency could add staff to the point that they could solve

every reported crime. In reality, there are some practical and political limitations making 100% clearance rates unlikely. The study also recognizes that there are a variety of other factors that can impact an agency's ability to clear reported crime. Some of those factors are inherent in the community, and others relate to the organization. Identifying and quantifying those factors is critical to this study's analysis.

Control Variables

As previously discussed, goals and objectives may vary from agency to agency, but generally they include outcomes such as preventing crime, reducing the harm caused by crime (for example, deaths, injuries, property stolen, etc.), identifying and apprehending offenders, being responsive to the community and increasing the feelings of safety and security for members of the community (Hatry et al., 1992). To achieve these outcomes, a department engages in a variety of processes, with specifiable and achievable outputs. Critical to these outputs are organizational factors, including a variety of inputs, as well as community factors, which can affect both the organizational factors and processes. To assess the effectiveness of their efforts, police administrators and researchers have developed a variety of measures, including the focus of this study: clearance rates.

The study recognizes there are a variety of other factors that could influence clearance rates and for which the study must control. Figure 3 is a simplified model of the relationship between agency size and clearance rates, controlling for a variety of the other variables. The existing (albeit limited) research has examined a variety of factors that can affect investigations and their

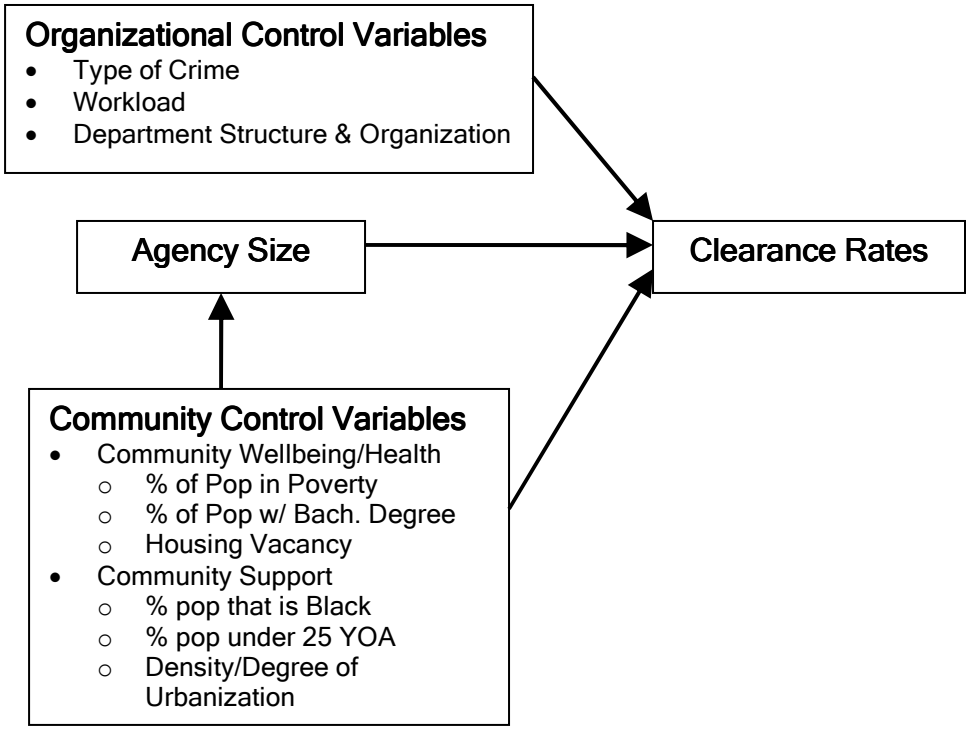

FIGURE 3: Control Variables

effectiveness and has identified several variables, including community size, demographics, and crime rates, that may influence the ability to clear crimes. Additionally, several of those community variables can also affect the size of the organization. The study hypothesizes that larger agencies will clear proportionally more crime than smaller agencies. As discussed previously, the theoretical basis for this hypothesis includes the ability of larger agencies to allocate manpower better and to dedicate staff exclusively to investigations in order to take advantage of experience and develop expertise, as well as to capitalize on factors typically associated with larger organizations. The combination of these factors will allow the department to clear a proportionally larger amount of the crimes reported.

Workload and Agency Variables

One of the most frequently cited limitations on investigative effectiveness is investigator caseload. A problem first identified by President Johnson's Crime Commission is that in almost every sizable department, detectives carry a caseload that is so large that it prevents adequate investigation of all but a small percentage of those cases (The Challenge of Crime in a Free Society, 1967). As caseloads increase, agencies have to prioritize their resources and responses (a triage approach) or limit the amount of time investigators can dedicated to each case. Conversely, agencies with smaller workloads can dedicate more resources and man-hours to their investigation. There is evidence that investigative workload impacts agency clearance rates, with the increases in crime rates leading to decreases in clearance rates. Cloninger and Sartorius (1979: 398) theorized that this relationship may be related to the increased investigative workload without a commensurate increase in police resources, creating "system strain." However, when the RAND study controlled for caseload, they found that departments with a higher proportion of officers assigned to investigations did have more arrests and clearances per police officer, supporting the hypothesis that adding investigators can increase arrests and clearances (Chaiken, 1975: 41). A basic measure of agency caseload has been used in a variety of studies and does appear to impact crime clearance rates (Paré, Felson, & Ouimet, 2007).

To calculate caseload, this study uses the number of reported Part I crimes (provided by UCR) and divides that by the number of full-time officers assigned to investigations (provided by LEMAS). The result is not an exact measure of investigator caseload, since investigators could also investigate crimes other than

Part I, such as drug offense, white-collar crimes, or fraud cases. However, this caseload measure should provide a good proxy measure of investigator workload, allowing for agency comparisons.

A related measure would be department workload. This is essentially all of the work that the entire department handles. Busier departments might not be able to dedicate the time and staff necessary to investigate each reported crime thoroughly. Workload would include not only reported crimes, but also other non-criminal related services that the community expects the police to provide. Examples of these miscellaneous incidents calls include escorts, lockouts, giving directions, information requests, welfare checks, as well as traffic enforcement, wreck investigation, and community service projects. While these may not be traditional crime control services, they may be important and a community may require their police provide these non-criminal related services. As part of the LEMAS survey, the Bureau of Justice Statistics (BJS) asked departments for both the total number of requests for service received from the public, as well as how many of these calls to which an officer was dispatched.

Workload variables are typically expressed as an amount of activity per employee (Gianakis & McCue, 1999). To calculate a department workload measure, the study uses total requests for service, divided by the number of total employees. LEMAS data includes both an estimated total request for service and total requests for service to which the agency dispatched an officer. Very often, the request for service and calls with an officer dispatched are different, since not every call requires a department to dispatch an officer. Many calls for service involve simple matters like directions, information, record checks, or other needs

that the police can handle via the telephone.

The study also includes two measures of the investigative caseload an agency handles. The first caseload variable is investigative caseload, which is the total number of index crimes reported divided by the number of the agency's officers assigned to patrol and investigative functions. This is an approximate measure of the number of cases and agency expects each officer to handle. A similar variable is department caseload, which is the total number of index crimes, divided by the total number of officers. This measure provides a comparative measure of total agency caseload. These variables are more reflective of the amount of crime an agency must handle, versus total calls for service, which could vary significantly, depending upon the agency's mission.

Another important variable related to workload and caseload variables is the types of crimes reported and investigated. A cursory review of the FBI's Uniform Crime Report reveals significantly different clearance rates for different types of crime. Nationally, the police clear a higher percentage of violent crime, on average clearing 44.3 percent of violent crimes versus 15.8 of property crimes (United States Department of Justice, 2006a). Even within the crime categories, there can be significant variation. For example, nationally, police clear more than half of the murders and aggravated assaults reported (60.7% and 54.0% respectively) while only clearing a quarter of robberies (United States Department of Justice, 2006a). Murders and assaults often involve persons known to each other (domestic partners, friends or family) and so identifying suspects is easier. Conversely, robberies often have lower clearance rates because they typically involve strangers and are typically short in duration, often with minimal interaction

between suspect and victim, resulting in less physical evidence.

Differences in clearance rates for different crime types should not be unexpected when considering the differing nature of Part I offenses. Property crimes (including burglary, theft, and car theft) typically occur without witnesses or the victims present, making the identification of offenders more difficult. Combine this lack of solvability factors and their shear volume (they account for more than 80% of the crimes reported to the police), property crimes have historically had relatively lower clearance rates. Violent crimes are, by definition, more serious, have the victim (and often witnesses) present, and may involve a physical confrontation. All this increases the chances of police securing physical evidence and identifying the offender. Research has found the presence or lack of eyewitnesses is the critical factor in solving crime (Chaiken, Greenwood, & Petersilia, 1976). To control for crime types, this study will conduct a separate regression analysis examining the effect of agency size on each Part I crime category.

The study also considers the role that agency structure and policing style play in an agency's ability to clear reported crimes. According to Maguire (2002), while there have been numerous studies describing and evaluating many of the aspects of police organizations (such as, corruption, violence, leadership, community relations, racism, and reform), the nature and role of the police organization itself has not been studied to any significant extent. Despite the fact that police officers have a great deal of discretion, the role of the officer's agency cannot be underestimated. Police agencies often adopt specific structural arrangements to control and direct the actions of their employees (Swanson,

1978).

One of the first to examine the role of agencies was James Q. Wilson (1968) in his seminal book *Varieties Of Police Behavior - The Management Of Law And Order In Eight Communities.* Wilson identified three basic styles that police agencies use: legalistic, service, and watchman. In legalistic-style departments, officers initiate formal contact with citizens and structure their work according to the criminal law. In service-style departments, officers initiate informal contact with citizens and rely less on the criminal law. In watchman-style departments, officers neither initiate contact with citizens as frequently, nor rely as much on the criminal law. Each of these styles is associated with distinct organizational arrangements and activities. This study will include control variables that attempt to capture these organizational distinctions.

The first set of control variables measures the bureaucratic structure of an agency. These include measures of the functional complexity, formalization and hierarchy. The first structure variable is complexity or specialization in an agency. Reimann (1973), who developed a series of variables that attempted to measure the structure of an organization, defined functional specialization as the number of discreet, identifiable functions performed by the agency. To operationalize this variable, this study develops a measure of complexity by adding the number of distinct services an agency provides. The LEMAS data includes a breakdown of distinct services offered and the more of these services provided, the more "complex" the mission. This is similar to task complexity measures used by Maguire (2002) and Wilson (2006) as they examined agency structure and community policing.

The second structural variable is formalization of rules and policies. Formalization, which is the extent an agency is controlled by formal rules, regulations and policies, and the extent that those rules are in writing (Reimann, 1973). Formalization is a means of controlling behavior by limiting individual discretion (Hall, Johnson, & Haas, 1967). The LEMAS survey asks each agency whether they have policies covering a variety of issues, including the use of deadly force, less-than-lethal force, dealing with juveniles and dealing with domestic disputes. It also asks agencies to characterize the level control in their pursuit policy. This study uses a measure created by simply adding the number subjects for which each agency has a written policy, as well as the restrictiveness of their pursuit policy. The most restrictive pursuit policies discourage all pursuits. Less restrictive policies restrict decisions of officers to specific criteria (such as type of offense, speed, etc.) and the least restrictive pursuit policies leave decisions to officer's discretion. The study codes agencies with no pursuit policy as 0, least restrictive as 1, moderately restrictive as 2 and most restrictive as 3. The value is added to the total number of policies to create the formalization variable.

The final area of an agency's structure is vertical differentiation or the amount of hierarchy in an organization. Height is the distance between the top levels and bottom levels of an organization. Ideally, this would simply be the number of ranks in an agency, identifying the number of levels between patrol officers and the chief of police (Maguire, 2002). Unfortunately, agency rank structure is not included in the LEMAS data set, so this study uses a measure of organizational height developed with salaries used by Langworthy (1986) and

Wilson (2006). LEMAS data includes salary related information, including salary ranges for police officers and the chief of police. The study calculates an organizational height variable by subtracting the lowest salary from the highest salary and dividing that by the lowest salary. The resulting variable is a measure of social distance or height of a department. The larger the number, the more distance between police officers and the chief of police.

The second aspect of the police organization included in the study is the agency's commitment to the principles of community policing. The challenge is that community policing is difficult to define, for both researchers and practitioners. Nevertheless, scholars and practitioners have developed some operational definitions (Maguire & Mastrofski, 2000). This study uses LEMAS data to develop variables that can help define an agency's commitment or engagement in the principles of community policing.

One of the key elements of community policing has been to decentralize the police to help them reach members of the community. The police have adopted tactics such as foot patrol and storefront stations in recent years to address neighborhood social disorder (Maguire, 1997). To measure decentralization, this study uses variables that attempt to measure the extent of spatial differentiation in a community. Spatial differentiation is the extent to which an organization is spread geographically (Bayley, 1992; Langworthy, 1986). A simple measure of spatial differentiation is the number of police facilities. As agencies attempt to improve access by the community, they can add precinct and division stations, storefront offices, fixed and mobile substations. According to Gianakis and Davis (1998), one of the most common community policing

techniques employed was restructuring patrol operations through the creation of decentralized substations. The number of police offices is available in the LEMAS data and this study utilizes this information to create a decentralization variable, which is simply the sum of the number of police facilities. Recognizing that simply because of their size, larger agencies are more likely to have more offices, this study also creates a decentralization rate variable that is simply the number of police facilities per 10,000 citizens.

The long form of the LEMAS survey asks departments to report the number of Community Policing Officers, Community Resource Officers, Community Relations Officers, or other sworn personnel specifically designated to engage in community policing activities. This study includes a variable that is the percentage of community police officers, which the study calculates with the number of community police officers and total number of police officers. As an agency's commitment and involvement in community policing increases, the percentage of community officers will increase.

However, community policing is more than decentralized facilities and dedicating police officers to community policing. It requires that agencies employ techniques and tactics that increase community involvement and problem solving. The LEMAS survey asks departments about their use of a variety of community policing tactics and techniques including problem solving training, holding community and business meetings, conducting citizen academies, assigning officers to geographic beats, and the use of citizen surveys. Utilizing the LEMAS data, this study creates a community-policing variable by totaling the number of techniques, tools, and tactics an agency reports that they use. The greater the

value of the community policing variable, the greater the commitment to and use of community policing.

The final agency related control variables involve the adoption and use of technology by the police. Increasing the use of technology should make the police more efficient and effective in their activities. Although the link is tenuous, researchers have found that computers do increase the effectiveness of police work, but only if police work is substantially reorganized to take advantage of their presence (Garicano & Heaton, 2006; Pattavina, 2005). To control for the varying levels of technology police agencies employ, this study creates two technology variables. The first involves technology for field use or technology that's supports uniformed patrol operations. Section VII of the LEMAS survey collects information on technology that police agencies employ. It includes the use of non-lethal technology, digital imaging, vehicle stopping and/or tracking equipment, and night vision/electro-optic equipment. It also includes an agency's use of video cameras and computers in patrol cars, and the information officers can access with those computers. This variable simply totals the number of technology related items an agency uses. The study uses the same concept to develop a variable that examines the use of technology to support administrative and investigations functions. Technology in this variable includes the use of Automated Fingerprint Identification Systems (AFIS), crime analysis and mapping systems, dispatching (CAD), intelligence gathering, and interagency information sharing networks. The study calculates this variable by simply adding the number of affirmative responses the agency has to the LEMAS survey. Higher values indicate a greater use of technology supporting investigations and administration.

Community and Demographic Variables

In addition to the impact of the workload variables, factors associated with the organization structure and community policing, and the types of crime the agency handle, there are also community and demographic factors that need to be included in the analysis. These variables can have an impact on both a department's ability to solve crimes, as well as on the structure (size) of the department itself. The impact or influence of these variables on clearance rates is probably not as significant as caseload, workload, and crime type, but this study cannot simply rule out their influence.

The level of support the police receive from the community is important for any police agency and their ability to solve crimes. The police rely on information brought to them by members of the community. Researchers have long recognized that one of the most important factors in solving crime is the quality of information police obtained by the first responding officer (Greenwood et al., 1975). This includes information from the victim as well as from witnesses. If the level of citizen support is low and citizens are not willing to contact and help the police, the task of solving crimes becomes much more difficult. Unfortunately, there are no direct measures of support for the police in this study's data set. There is, however, research that examines support for the police. Researchers have identified or developed several variables that can approximate community support.

Citizen satisfaction is one such factor that has been linked to support of and willingness to contact the police with information (Decker, 1984). With no direct measure of citizen satisfaction available, this study turns to variables that

research has linked to citizen satisfaction and attitudes toward the police. Two individual factors that research has repeatedly linked to attitudes towards the police are age and race (Brown & Benedict, 2002). Several studies have found that younger people and minorities, particularly African Americans, often have less favorable attitudes towards the police and have less confidence in police than whites (Maxson, Hennigan, & Sloane, 2003; Huang & Vaughn, 1996; Flanagan & Vaughn, 1996). This less favorable attitude toward the police could result in less support for and information provided to the police. In one study of factors affecting homicide clearances, Puckett and Lundman (2003: 185) found lower clearances in predominately-black census tracts and theorized that the significantly lower clearance rates in these census tracts were a function of less trust and less cooperation and information from citizens. In addition to the impact race on levels of police support, some researchers have suggested race plays a more direct role in the amount of crime the police clear. Black (1980) asserts that the police may be less willing to investigate crimes with minority victims vigorously, leading to lower overall clearance rates. Others have suggested that higher clearance rates could be expected in denser, more urban areas with higher percentages of minority residents because the police patrol and work more aggressively, with less regard for personal rights (Sampson, 1986; Smith, 1986). To operationalize these age and race factors, this study uses census data to calculate the percentage of the jurisdiction population that is African American and the percentage of the jurisdiction under 25 years of age.

Another factor related to community support, is a variable that estimates the “degree of urbanization.” Research has linked degree of urbanization, which

can be measured with population density, to the number and types of crimes reported (Watts, 1931; Rattner, 1990) which, in turn, can theoretically impact police investigative efforts. While increase urbanization could increase the probability of witnesses, urban areas also provide a level of anonymity for potential offenders, making their identification by witnesses and ultimately the police much less likely (Willmer, 1970). Higher population densities are also often associated with communities where there is a prevailing attitude of police mistrust and/or preferences against cooperation with police (Marche, 1994). While the presence of a witness is one of the strongest predictors of crime clearance (Stevens & Stipak, 1982), a lack of citizen cooperation could reduce evidence and eyewitness availability and ultimately lead to decreased crime clearances. Two recent studies in Florida did find a negative correlation between population density and police clearance rates (Goltz, 2007; Wolf, Korosec, & Goltz, 2008). To account for this factor, the study will include a density variable. To calculate density, this study divides a jurisdiction's population by its area (square miles). These figures are included in the LEMAS data.

Finally, research has linked crime clearance rates to the financial well being of the community and its residents (Paré, Felson, & Ouimet, 2007). Researchers have documented a link between poverty and crime rates (Blau & Blau, 1982; Wilson, 1987), but there is also evidence to suggest that poverty and crime *clearances* may be linked. There is no agreement on the cause, nature or even direction of this relationship. Sullivan (1985) found lower crime clearance rates in poor communities, while both Borg and Parker (2001) and Ouimet and Paré (2003) found higher clearance rate in poor areas. Litwin's (2004) research

found mixed results. Regardless of the nature of the relationship, the impact of poverty on crime is undeniable and this study proposes to include as a control variable the percentage of the jurisdiction living below the poverty level. Economic data are available from the US Census Bureau.

In addition to a link between economic status of residents and clearance rates, the overall economic well-being of a municipality can affect clearance rates. Theoretically, poorer municipalities may not have the financial resources to add staff, acquire technology (e.g., computers, crime lab services, and DNA testing), or provide the training necessary to be able to investigate crime most effectively. The economic well-being of the municipality will also play a role in agency size, since any expansion of the police agency would require funds and resources. Municipalities that are more financially sound can more easily enlarge their agencies to handle crime and caseloads. Conversely, financial hardship or difficult economic times might force municipalities to reduce spending on services, directly influencing agency size. Agency size variables, as well as the technology variables allow the study to more directly account for the potential impact of community well-being on agency structure.

The study will use a jurisdiction's median income as the variable to describe the relative fiscal well-bring of the municipality. Using median income as a measure of economic well-being is well established and a variety of studies have used median income as an economic measure in a community including studies of crime and crime rates (Kennedy et al., 1998; Blau & Blau, 1982). Theoretically, communities with lower median incomes will demand and consume a greater range of governmental services, including, but certainly not limited to,

law enforcement. Compounding the effect is that communities with lower median incomes will provide less financial resources for their local governments. The result is that communities with low median income can compound economic difficulties for municipalities and there is a growing body of research that support this hypothesis (Gottlieb, 2000). A recent study of Florida police agencies found that communities with higher poverty rates, higher unemployment, and higher rental rates require more police resources (Wolf, Korosec, & Goltz, 2008).

Population and Sample

This study utilizes Uniform Crime Report data that include the numbers and type of offenses reported and the number of those offenses cleared, that nearly all police agencies submit to the FBI. Unfortunately, UCR crime data are somewhat limited. While the UCR does contain the number of reported crimes, and the number of those crimes cleared for more than 17,000 police agencies and covers more than 95% of the nation's population, it contains little demographic data or environmental and community factors that this study requires. UCR data includes only basic agency information and is limited to the agency name and address and some basic demographic data, including region of the country, metropolitan statistical area (MSA) of the agency's jurisdiction and the size of the population served by the agency. UCR data do not include detailed agency information, such as size, nor do they include any community variables.

To overcome this limitation, this study augments the UCR data with the most recent Bureau of Justice Statistics (BJS) Law Enforcement Management and Administrative Statistics (LEMAS) Sample Survey of Law Enforcement

Agencies. The survey is a nationally representative sample of publicly funded state and local law enforcement agencies operating nationwide. The Bureau of Justice Statistics conducts the survey every three to four years, sending the survey's questionnaire to a representative sample of all police agencies in the United States. In addition, the Bureau of Justice Statistics sends the survey to all police agencies with more than 100 sworn officers. In 2003, the survey had a 90.6% response rate and the resulting data set contains information on 2,859 agencies, although larger agencies may be overrepresented. The data are useful because in addition to agency personnel information, the survey gathers information on a variety of department characteristics, activities, and responsibilities.

In addition to agency descriptors, the LEMAS survey includes information on department personnel, operations, specialized units, community policing, emergency preparedness, equipment, and policies and procedures. Descriptive information includes the services offered or handled by the agency, such as patrol, investigations, crime prevention, education, dispatching, and record keeping, as well as a breakdown of the authorized and actual numbers of sworn officers and civilian employees, including part time employees. The staffing information also includes a breakdown of those employees by their function (for example, patrol, investigations, court security, etc.) and the total annual budget. The personnel section includes information on educational requirements and testing for recruits, academy, field and in-service training as well a breakdown down of personnel by gender, race and ethnicity. The operation section of the survey looks at calls for service, 911 equipment, holding and jail facilities and

vehicles used by the department (for example, cars, motorcycles, boats, aircraft, etc.). The survey also examines whether the department operates any specialized units, such as hate crime, bomb disposal, cybercrime, domestic violence, gang, victim assistance, terrorism, crime analysis or juvenile units. The community policing sections reports on variables that attempts to gauge the level and commitment to community policing, such as the type of community oriented training, number of community meetings, and citizen feedback methods and their use. The equipment section focuses on the type of equipment available to personnel. This includes issued equipment such as sidearm, chemical irritants, body armor, laptops, as well as department wide equipment such as fingerprint (AFIS) computers, digital imaging, crime analysis and other computer systems. The survey also collects information of emergency preparedness and department policies and procedures (Hickman & Reaves, 2006).

The most recent version of the LEMAS Sample Survey of Law Enforcement Agencies data are from 2003 iteration and is available from the Inter-University Consortium for Political and Social Research (ICPSR). Unfortunately, that data set did not include Originating Agency (ORI) codes. ORI codes are unique police agency identifiers assigned by the Justice Department originally for the purpose of submitting Uniform Crime Report data. The Justice Department now assigns ORI codes to other policing agencies, such as fire marshals, alcoholic beverage control agencies, regional and special purpose task forces, Federal agencies, and private colleges as well. The ORI code is the police agency equivalent to an individuals social security number. But until recently, the LEMAS data did not include ORI numbers. There have been

recommendations to include ORI numbers in future data sets (Maguire et al., 1998). Without ORI codes, linking the data in the UCR with data from the US Census Bureau and LEMAS data sets presents a significant challenge. Without a common data field, the automatic merging of data sets using statistical analysis software is not possible. Matching data would require manual searching and comparing each record. Even this method would be time consuming and challenging because of differences in reporting formats. UCR reports agency name as the jurisdiction, while LEMAS includes the full agency name (e.g., Groton versus City of Groton Police Department).

To overcome this, the second phase of data preparation involved adding ORI and geographic identifiers to the LEMAS data using the Law Enforcement Agency Identifiers Crosswalk file. The Bureau of Justice Statistics (BJS) and the National Archive of Criminal Justice Data (NACJD) created the Law Enforcement Agency Identifiers Crosswalk (LEAIC) file, allowing for the lining of crime data to specific local governments for formula grant purposes (Lindgren & Zawitz, 2001). The Law Enforcement Agency Identifiers Crosswalk file lists more than 23,000 police agencies and includes their ORI codes as well as the other major identifying standards in use today, including the LEMAS Agency ID codes.

With the ORI codes in the LEMAS file, the process of merging LEMAS and UCR data became greatly simplified and could now be accomplished using statistical analysis software. Combining the crime data from the 2003 UCR with the 2003 LEMAS provides this study with its dependent and independent variables (clearance rates and agency size respectively).

Unfortunately, neither the UCR crime data nor the LEMAS survey data

includes community demographic factors or variables. The next phase of the study involved adding community demographic factors or variables to the newly formed data set. The data needed to create those variables are available from the United States Department of Commerce, Bureau of the Census. The next phase of the data preparation involved obtaining demographic data and added it to the study's data set.

Community data are available from the Census Bureau's American Fact Finder website (http://factfinder.census.gov/home/saff/main.html). However, since the focus of this study is agency level, it became necessary to go to the Census of Population and Housing for 2000 for data. Based on the control variables identified earlier, a variety of data files for each agency listed in the LEMAS survey were obtained from the Census 2000 Summary File 3 (SF 3) by downloading the following tables for each jurisdiction: G001 - Geographic Identifiers, P5 - Urban and Rural, P6 – Race, P37 - Sex by Educational Attainment for the Population 25 Years and Over. P43 - Sex By Employment Status For The Population 16 Years And Over, P53 - Median Household Income In 1999, P77 - Median Family Income In 1999, P82 - Per Capita Income In 1999, P87 - Poverty Status In 1999 By Age, and H6 - Occupancy Status. With the addition of geographic identifiers and FIPS codes from the Law Enforcement Agency Identifiers Crosswalk file, this task was relatively straightforward, although somewhat what tedious and time consuming.

The Geographic Identifiers file (G001) contains area name (Legal/Statistical Area Description), land area and state, county, county subdivision and place FIPS codes. The Urban and Rural file (P5) contains a

population data, including total, urban, rural, rural farm and rural nonfarm populations. The Race file (P6) breaks down the population by race and ethnicity. The Sex by Educational Attainment for the Population 25 Years and Over (P37) includes the number of high school graduates, some college and college graduates (associates, bachelors, masters, and professional and doctorate degrees) for males and females over 25 years of age. Similarly, the Sex by Employment Status for the Population 16 Years and Over (P43) contains data broken down by sex on employed, unemployed, and active military persons over 16 years of age. The income files (P53, P77, and P82) contain median household, median family and per capita income in 1999. The Poverty Status In 1999 By Age file (P87) includes percentage of the population with income in 1999 below poverty level, and the Occupancy Status (H6) files contains numbers of occupied and vacant housing. Once downloaded, the next phase of preparing the data was checking the census data by comparing common fields, such as jurisdiction name, population, and FIPS code. The next phase involved adding the data from the Census files to all police agencies in the LEMAS data set and calculating the variables needed for this study.

The final step in the data preparation phase of the study involved ensuring the added UCR and census data were accurate and removing agencies that were missing critical data or did not contribute the analysis. This included removing 18 police agencies in the LEMAS data set did not have an ORI number and, consequently, did not have any data submitted to the UCR and would not contribute to the analysis. These agencies were either very small or tribal police agencies. Other agencies (typically a county or state agency) handled the

reporting crime statistics within those jurisdictions.

In addition to the agencies that did not submit any data to the UCR, not all UCR submitting agencies report complete crime and crime clearance data. In 2003, approximately 30% of agencies submitting data did not include crime related data (submitting basic agency related data only). In the LEMAS database, 366 agencies fell into this category and were excluded from this study's data set. There were also agencies that submitted incomplete crime data. For example, the two largest police departments, the New York City and Chicago police, report only the total number of reported crimes for each category. Agencies in this category did not report the number of crimes cleared and consequently, these agencies appear to have a clearance rate of zero. The UCR identifies agencies submitting only reported crimes and no clearance data. Since calculating usable and accurate clearance rates is not possible, the study also excludes these agencies. Finally, since the focus of this study is on local policing, this step included removing all state and tribal agencies. As a result, the data set for this analysis contains 2,271 municipal, regional, county police and sheriffs offices.

This final data set contained a complete set of descriptors for each agency. These variables include basic characteristics, functions and responsibilities, and includes the number of full-time and part-time personnel, including sworn (with and without arrest powers) and non-sworn (civilian) personnel. LEMAS agency size refers to the number of total employees, which includes sworn officers and non-sworn or civilian employees. The Department of Justice defines sworn officers as individuals who ordinarily carry a firearm and a badge, have full arrest

powers, and are paid from government funds set aside specifically for law enforcement (United States Department of Justice, 2007b). A sworn officer without arrest powers refers to jailers and detention officers who work with agencies operating jails. Non-sworn or civilian employees typically include support and clerical staff such as communications, administrative support, jailers, correctional officers, and forensic services. The LEMAS data includes both the number of authorized employees and sworn officers, as well as the actual number of employees and sworn officers. These figures may differ because agencies may not fill all authorized positions due to policy or budgeting constraints. This study examines actual total number of employees, as well as actual number of sworn officers and actual number of civilian employees.

As a measure of department effectiveness, this study uses crime clearance rates. The Uniform Crime Reporting Program Data for 2003 is available from the ICPSR and provides figures for Offenses Known and Clearances by Arrest. The Department of Justice collects and reports the Uniform Crime Report data on a monthly basis and so the final step in preparing the data set was to aggregate them into yearly totals. There are several reasons for doing this. First, several jurisdictions do not submit monthly reports, instead reporting statistics either quarterly (i.e., Rhode Island) or annually (i.e., Alabama and Florida); so some of the data were already aggregated. Secondly, aggregating will help deal with updated figures that can cause problematic results. Current UCR reporting practices allow police agencies to update their UCR submission by simply reporting the updated figures in following months. For example, if a department has ten burglaries reported in January, but cannot clear

any of them, the department reports ten crimes with zero clearances. If they solve all ten next month, with no new reported crimes, they would report zero crimes with ten clearances. Aggregating can resolve many, but not all, of these issues and thereby improve the validity and reliability of this measure. The final data set does include several such situations. For example, using 2003 aggregated data, there were 43 departments with a murder clearance rate of more than 100%. One of those agencies, the El Paso County (TX) Sheriff Department, had one reported murder but cleared three murders. This results in a 300% clearance rate. The most likely reason for this was clearing murders that the agency had reported to the UCR in previous years. While such clearance rates do indicate significant effort and success on the part of the reporting agency, this study will consider clearance rates in excess of 100% as equal to 100%.

Using the LEMAS random sample of local police agencies, this study compares the clearance rates for the reporting police agencies, while controlling for workload, environmental, community and agency factors that may influence crime clearance rates and investigative effectiveness.

Data Analysis

This study examines the relationship between the size of a police agency and its ability to clear reported crimes. The study uses agency size as measured by the total number of actual sworn officers and total number of employees as the independent variable. Since there are several agencies in the data set that employ a significant number of part time employees (relative to the number of full-time), this analysis considers each part time employee as the equivalent of one-

half a full-time employee. Several agencies (typically sheriff's offices) also list officers without arrest powers. These officers are typically involved in non-patrol or investigative roles, such as detention, court security, or process serving. This study counts officers without arrest authority as employees, but does not include them in the sworn officer totals.

The study looks at the impact of agency size on seven crime categories; murder, rape, robbery, assault, burglary, larceny, and vehicle thefts. Because of its unique nature, arson is not included in this study. Many arson crimes are investigated by other, often non-police agencies, such as fire departments or fire marshals offices. For each crime category examined, the study looks at the percentage of crimes cleared (a value ranging between 0 and 100%) and excludes agencies with no reported crimes in that category. As discussed previously, the UCR reporting rules allow for clearance rates above 100%. However, this study considers clearances rates above 100% as equal to 100%.

Using linear regression also requires transforming some of the data. The study hypothesizes that the relationship is not linear, but instead is an upward curving relationship (see figure 2). The curve is exemplified by the function $y = \log(x)$. Additionally, the distributions of the agency size measures (both sworn and total employees) are not normal and therefore violate one of the assumptions necessary for linear regression. Reviewing a scatterplot of these data shows a positive skew for agency size measures. To handle the non-normal distribution and nonlinear relationship, this study uses the natural log of agency size measures for the regression analysis.

After transforming the size variables, the study uses SPSS statistical

analysis software to conduct a series of linear regression. This analysis examines the relationship between crime clearance rate and agency size, while controlling for workload/caseload, community demographics, agency related, and crime type variables. To do this, the analysis will use a hierarchical analysis. In the first step, the analysis will enter all the community and caseload variables to develop a significant model. The second part will then add the agency size variable. The study adds the size variable in the final step. The resulting regression analysis measures the effect of agency size on crime clearance rates, while controlling for other community, caseload, and agency-related variables.

Summary

The goal of this study is to measure the association between police agency size and their ability to clear reported crimes. The study hypothesizes that larger agencies, with greater staffing flexibility and other economy of scale advantages typically associated with larger sized organizations, will clear a greater percentage of the crimes reported. The study also recognizes that there are a variety of other factors that can influence clearance rates, so the analysis proposes to control for individual, community and organizational factors. This section of the study has highlighted the theoretical bases for each of these variables, as well as limitations and concerns.

To test the proposed model, the study develops a data set by combining 2003 UCR and LEMAS data, supplemented with Census Bureau data to create all of the needed control variables. Before the analysis, the study must transform the independent variables by taking the log of both size variables. Taking the log converts the curved relationship to a linear one and helps to ensure the

distribution of the variable does not violate assumptions necessary for linear regression. With this data set, this study will use SPSS Statistical Analysis software to conduct a linear regression to assess the influence of police agency size on crime clearances after controlling for the affect of the significant individual, community, and organization variables. The next chapter examines the results and findings of the analysis for each of the crime categories.

CHAPTER 4: ANALYSIS AND RESULTS

This study examines the impact that a police agency's size has on the agency's ability to clear reported crimes. The hypothesis is that agency size will be positively related to the percentage of crimes cleared (clearance rate). Specifically, the study looks at the effect of size on the clearance rates for seven of the UCR index crime, including murder, rape, robbery, assault, burglary, larceny, and auto theft (arson is not included). The independent variable for this study is size. The analysis will look at size as measured by both the total number of sworn police officers and total number employees, which includes both sworn officers and civilian employees. The study theorizes that the relationship between size and clearance rates is not linear, but rather it is a curvilinear relationship. The curve starts with a steep slope, and then leveling off has agency size increases, essentially a logarithmic curve. Because the relationship between size and clearance rate is not linear, the regression analysis uses the log of the number of sworn officers (sworn officers) and the log of the number of total number of employees (total employees). Using the log of the size variable transforms the curved relationship into a linear relationship and normally distributes the size variable, both necessary for linear regression.

Study Variables and their Descriptives

Table 1 contains the descriptive statistics for the dependent and

TABLE 1: Descriptive Statistics of Study Variables

Summary of the descriptive statistics for the dependent and independent variables

Variable	*Minimum*	*Maximum*	*Mean*	*Median*	*SD*	*n*
Total Sworn Officers with Arrest (includes P/T emp.)	1.00	9307.00	145.03	46.00	438.24	2271
Total Employees (inc. P/T and Ofc w/o arrest powers)	1.00	14974.50	218.13	67.50	636.07	2271
Adjusted Percentage of Murders Cleared	0.00	100.00	68.14	80.00	35.91	1070
Adjusted Percentage of Rapes Cleared	0.00	100.00	45.00	42.86	32.70	1764
Adjusted Percentage of Robberies Cleared	0.00	100.00	36.82	32.47	27.20	1761
Adjusted Percentage of Assaults Cleared	0.00	100.00	61.90	63.95	23.89	2219
Adjusted Percentage of Felony Assaults Cleared	0.00	100.00	63.86	65.00	24.61	2124
Adjusted Percentage of Simple Assaults Cleared	0.00	100.00	60.99	63.07	25.39	2196
Adjusted Percentage of Burglaries Cleared	0.00	100.00	15.73	12.33	14.76	2202
Adjusted Percentage of Larcenies Cleared	0.00	100.00	19.58	16.78	15.31	2220
Adjusted Percentage of Vehicle Thefts Cleared	0.00	100.00	23.43	16.67	22.85	2123

independent variables this study uses. The study's independent variables are total number of sworn officers and total number of employees. Both have 2,271 cases (the size of the data set) and minimum values of 1. The maximum value for number of sworn officers is 9,307 and the maximum value for total employees is 14,974.5 (part time employees are counted as .5 employees). The mean number of sworn officers is 145.0 versus a median of 46 sworn officers. The mean number of total employees is 218.1 and the median is 67.5. The dependent variables for the study are adjusted percentage of crime cleared. The study adjusts all clearances so that no department has a clearance rate of more than 100% in any category be reducing any clearance greater than 100% to

100%. As a result, the minimum value for all categories is 0 and the maximum value is 100. The n value reflects the number of agencies that have had at least one crime reported in the category. As shown in Table 1, the n values for crime categories range from 1,070 for murder to 2,220 for the crime of larceny.

As discussed in chapter 3, there are a variety of other variables that can influence agency clearance rates. Research has shown that department workload is an important factor and they can affect clearance rates (Chaiken, 1975; Cloninger & Sartorius, 1979; Cordner, 1989). This study proposes to include several workload measures in each analysis, including Workload (defined as total requests for service/total employees), Caseload (total crimes per total sworn officers), and Investigative Caseload (total crimes per number of patrol and investigative personnel). The study also theorizes that the level of community support is critical to an agency's ability to clear reported crimes (Brown & Benedict, 2002; Decker, 1984).

There is no direct measure of community support associated with this data set, so the study utilizes several proxy measures. In chapter 3, the study identified several demographic and community characteristics that research has consistently correlated to community support (Maxson, Hennigan, & Sloane, 2003; Puckett & Lundman, 2003). These factors include the percentage of the population that is African American or black, percentage of the population that is under 25 years of age (population under 25), and the percentage of population that is over 25 years of age with a Bachelors degree (population with degree). Related to these community support factors is the degree of urbanization of the community (Willmer, 1970) and the study includes both percentage of the

population considered urban (urban population) and the population density. Research has also linked the relative health or wellbeing of the community to an agency's ability to clear crimes is (Paré, Felson, & Ouimet, 2007). To incorporate these factors, the study includes percentage of population living below poverty line (population in poverty), median household income (median income) and the percentage of the population over 16 years of age that is unemployed (population unemployed), and the percentage of housing vacant (percentage vacant housing).

This study hypothesizes that agency size plays a significant role in a department's ability to clear crimes, but also recognizes that other organizational factors can play a role. In addition to community and demographic characteristics, the analysis will also consider police structure and strategies. As previously discussed, the study includes variables that measure the role of agency structure, community policing, and technology (Maguire, 2002; Wilson, 2006). The study uses three measures of agency context or structure. They are mission complexity, formulization of the rules (formulization), and vertical differentiation (height). The study also includes measures of a department commitment or involvement with the community policing philosophy. These measures include the extent of agency decentralization (decentralization), the percentage of officers dedicated to community policing (community police officers) and commitment to the use of community policing strategies (CP strategies). Final, the study also considers the use of technology by police agencies, with two variables. The first looks at technology in support of field or patrol operations (technology field) and technology in support of investigative and

administrative function (technology investigation). Table 2 contains the descriptive statistics for all of the control variables used in this study.

As shown in Table 2, all the workload variables have a minimum value of 0. Several of the agencies reported no crimes and reported no calls for service statistics. The 2003 LEMAS survey actually uses two different survey instruments, a long form, and a short form. The short form does not include the number of calls for service received or dispatched. It also does not obtain breakdowns of personnel by responsibility (i.e., patrol, investigative, jail or court related duties). As a result, the n values for the workload and investigative caseload are 753 and 762 respectively. The caseload variable has an n value of 2,271.

All of the community variables also have an n value of 2,271. The percentage of population African American or black has a minimum value of 0, a maximum of 95.7, a mean of 10.9 and a median of 3.5. The percentage of population under 25 years of age ranges from 4.8 to 75.9, with a mean of 34.6 and a median of 34.4. The percentage of population (over 16 years of age) unemployed has a mean value of 3.5, a median value of 3.3, with a range from 0 to 18.6. The percentage of population with bachelor's degree also varies from 0 to 44.6, with a mean value of 14.7 and a median value of 12.8.

The study proposes to use several variables related to the socioeconomic status of a community and its residents. Obtained from the Census Bureau, the study community variables include the percentage of the population living below poverty line ranges. The percentage of the population living below the poverty

TABLE 2: Descriptive Statistics of Study Control Variables

Summary of the descriptive statistics for the proposed control variables

Variable	*Minimum*	*Maximum*	*Mean*	*Median*	*SD*	*n*
Workload (total requests for service/total emp.)	0.00	4298.14	543.23	432.95	461.32	753
Caseload (total crimes per total sworn officers)	0.00	137.08	22.35	19.91	14.99	2,271
Investigative Caseload (crimes per invest. persnl.)	0.00	3420.67	171.95	158.97	169.76	762
Percentage of Population African American or Black	0.00	95.67	10.86	3.54	15.72	2,271
Percentage of Population Under 25 YOA	4.76	75.88	34.57	34.36	5.82	2,271
Percentage of Pop (over 16) Unemployed	0.00	18.61	3.51	3.27	1.59	2,271
Percentage of Pop (over 25) with Bach. Degree	0.00	44.55	14.65	12.84	7.47	2,271
Percentage of Population Living below Poverty Line	0.00	51.93	12.72	11.71	7.34	2,271
Median household income in 1999	12,663	193,157	41,809	37,584	16,304	2,271
Per capita income in 1999	7,695	98,643	21,022	18,853	8,593	2,271
Population density (pop/area)	0.08	55421.19	2009.27	1177.23	3155.34	2,271
Percentage of Pop described as Urban	0.00	100.00	76.31	96.49	34.60	2,271
Percentage of Housing Vacant	0.60	85.73	9.76	7.42	9.11	2,271
Mission Complexity Scale	1.00	35.00	21.08	21.00	4.67	2,269
Formalization of rules and policies	0.00	19.00	14.87	16.00	2.92	2,258
Organizational Height	0.04	6.27	1.59	1.46	0.90	2,271
Decentralization (Police Facilities per 10000)	0.01	161.29	1.72	0.66	4.72	2,271
Number of Police Facilities	1.00	101.00	3.25	2.00	5.39	2,271
Percentage of Comm. Police Officers	0.00	100.00	15.21	3.17	28.58	2,271
Use of Community Policing Strategies	1.00	25.00	8.73	8.00	5.99	2,258
Technology for Field Use	0.00	27.00	10.13	10.00	5.54	2,255
Technology for Investigations	0.00	34.00	18.55	19.00	7.63	2,268

line rages from 0 to 51.9, with an average of 12.7 and a median value of 11.7. Median household income has an average value of 41809, and average per capita income 21022. The study also proposes two variables that examine the role of urbanization. Population density (defined as population divided by the area) ranges from a low of 0.08 to a high of 55421.2, with an average value of 2009.3. The percentage of population described as urban, which varies from 0 to 100, has an average value of 76.3 and a median value of 96.5.

Finally, the study also includes variables that examine the police organization itself. The LEMAS survey asks about 37 different areas of responsibility, such as law enforcement, criminal investigations, traffic and court related functions, as well as special operations (e.g., bomb disposal, SWAT) and special public safety functions (e.g., animal control, school crossing services or EMS). The mission complexity variable is a measure developed by summing the number of discrete functions for which an agency reported it is responsible for providing. No agency listed all of the functions, but all agencies provide at least service (typically patrol), so the minimum value is 1. The high was 35, and the average number of responsibilities is 21.1. The formalization variables looks at the number and nature of rules and policies a department has. The range of scores is from 0 to 19, with an average of 14.9. The organizational height variable is a measure used by researchers to estimate the layers or ranks of an agency and utilizes the differences between the highest and lowest paid officers in a department. The study calculates the organizational height variable by subtracting the lowest salary from the highest salary and dividing that by the lowest salary. Height varies from 0.04 to 6.3 with an average of 1.6 and a median

of 1.46.

From the LEMAS data, the study creates three variables to measure the extent of community policing in an agency. Decentralization looks at the number of facilities an agency uses to service the community. One of the most commonly used community policing tactics is to decentralization officers and facilities into the community (Gianakis & Davis, 1998). This tactic makes community-officer interactions simpler and easier, enhancing the relationship. Police Facilities is simply the number of offices, precincts, and substations an agency operates and ranges from a low of 1 to a high of 101. The average number of facilities is 3.3. A related measure is decentralization. This study defines decentralization as the number of police facilities per 10,000 population. Higher rates would suggest agencies have greater citizen access, a concept consistent with community policing. The values ranged from a low of 0.01 to a high 161. The average value is 1.7. Other community policing variables include percentage of officers designated as community police officers (average 15.2%) and a variable that looks at the number of community policing strategies an agency employs. The LEMAS survey asked agencies about 25 possible activities and strategies, ranging from community meetings, to the use of citizen surveys. This measure is simply a total of the activities they have used. Several agencies have the maximum possible value of 25, and every agency reported it employs at least one. The average number of strategies used is 8.73.

The final category of police related variables involves agencies and their use of technology. This study breaks down technology into two sub categories: technology used in support of field operations, and technology used in support of

investigative or administrative tasks. The technology for field use variable is the sum of the number of technologies that an agency reported they used on the LEMAS survey. Variable include using tools and technologies like hand-held electrical immobilization devices (i.e., tasers), night vision equipment, infrared (thermal) imagers, stolen vehicle tracking equipment (i.e., LOJACK) and tire deflation devices like stop sticks. The variable has 35 measures and values range from 0 to 27. The average was 10.1. The technology for investigations variable is similar to technology for field operations. The variable looks at 35 possible measures, including use of computer system to analyze community problems, crime analysis, crime mapping, and crime investigations. It also includes administrative functions, such a fleet management, personnel records, records management, and resource allocation. The values range from 0 to 34, with an average value of 18.6.

Linear Regression and Assumptions

This study uses linear regression to model the value of percentage of crime cleared based on its relationship to the size of the agency, while controlling for a variety of other factors. Linear regression attempts to estimate the coefficients of the linear equation that best predicts the value of the study's dependent variable. To use linear regression, the dependent and independent variables should be continuous. Multiple regression builds upon the principles of linear regression, except that it attempts to predict based upon the inclusion of multiple independent variables that are unrelated.

Linear regression assumes that the relationship between the dependent and independent variables is linear and all observations are independent. Linear

regression assumes that for each value of the independent variable, the distribution of the dependent variable must be normal. Linear regression also assumes that the error term has a normal distribution with a mean of 0. The variance of the error term is constant across cases and independent of the variables in the model. To confirm that the data do not violate any of the assumptions necessary for regression, the study first uses SPSS statistical software to conduct an analysis and create diagnostic statistics and plots.

This study uses well-established regression techniques to predict the variance in clearance rates for UCR Part I crimes, based on linear combinations of a variety of individual, community and department focused control variables. Regression is well suited for this type of analysis. This study's dependent and independent variables are continuous and most (but not all) are normally distributed. The variable descriptive statistics reveals distributions other than normal for several of the variables, including both the study's size variables, as well as several demographic and agency related control variables. Mathematical transformations can transform these variables to achieve normality, while retaining the structural information needed for this analysis.

A more problematic issue is the assumption of a linear relationship. As discussed in chapter 3, the study hypothesizes that the relationship between agency size and crime clearance rates would be nonlinear. The study theorizes that the relationship would start with a sharply upward slope, leveling out as size increases (see figure 2). With a non-linear relationship, regression analysis will underestimate the relationship. That is, R-square will underestimate the variance explained overall and the betas will underestimate the importance of the variables

involved in the non-linear relationship. While minor deviations from linearity will not substantially affect the interpretation of regression output, the curved relationship hypothesized in this study will create problems. To handle this, the study will transform the size variables by taking the natural log of both sworn officers and total employees. Taking the log transforms the curved model to a linear one and normally distributes the independent variable.

The next phase in the study's analysis is to check all of the control (independent) variables for correlation. If there is significant correlation between two (or more) variables, collinearity may be a problem, resulting in imprecise regression coefficient estimates and increasing the standard error. The similar nature of several of the potential control variables makes testing for correlation critical. Variables that are highly correlated, e.g., correlated at 0.6 level or higher, are potentially problematic (Leech, Barrett, & Morgan, 2004). Using SPSS's Bivariate Correlations procedure to compute a Pearson's correlation coefficient for all control variables confirmed several measures are highly correlated (see Table 3). Several of the workload variables are highly correlated, above the Pearson correlation coefficient threshold of 0.6. The study develops three variables that measured agency workloads. They are workload (total calls for service per employees), caseload (total crimes per total sworn officers), and Investigative Caseload (total crimes per number of patrol and investigative personnel). Investigative caseload and caseload have a Pearson coefficient of 0.6. Because of the high correlation, the study will omit the investigative caseload variable.

TABLE 3: Correlations – All Potential Variables

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
1	Log of Total Sworn	1.00																																
2	Log of the Total Employees	0.98	1.00																															
3	Adjusted Percentage of Murders Cleared	-0.04	-0.04	1.00																														
4	Adjusted Percentage of Rapes Cleared	0.01	0.00	0.21	1.00																													
5	Adjusted Percentage of Robberies Cleared	-0.18	-0.17	0.22	0.34	1.00																												
6	Adjusted Percentage of Assaults Cleared	-0.12	-0.12	0.16	0.44	0.35	1.00																											
7	Adjusted Percentage of Felony Assaults Cleared	-0.15	-0.15	0.25	0.40	0.37	0.75	1.00																										
8	Adjusted Percentage of Simple Assaults Cleared	-0.08	-0.08	0.14	0.42	0.32	0.97	0.63	1.00																									
9	Adjusted Percentage of Burglaries Cleared	-0.13	-0.13	0.14	0.34	0.36	0.40	0.34	0.38	1.00																								
10	Adjusted Percentage of Larcenies Cleared	-0.07	-0.09	0.09	0.33	0.32	0.47	0.35	0.44	0.61	1.00																							
11	Adjusted Percentage of Veh Thefts Cleared	-0.22	-0.20	0.10	0.32	0.36	0.42	0.37	0.39	0.47	0.46	1.00																						
12	Workload (total requests for service/total employees)	-0.07	-0.13	-0.01	0.01	0.00	-0.06	-0.05	-0.06	-0.04	0.01	-0.08	1.00																					
13	Caseload (total crimes per total sworn officers)	0.33	0.31	-0.03	-0.08	-0.14	-0.18	-0.21	-0.15	-0.14	-0.05	-0.15	0.29	1.00																				
14	Investigative Caseload (total crimes per patrol and invest)	0.06	0.04	-0.04	-0.00	-0.10	-0.13	-0.17	-0.11	-0.13	-0.03	-0.12	0.19	0.63	1.00																			
15	Percentage of Population African American or Black	0.26	0.23	-0.09	0.01	-0.17	-0.15	-0.18	-0.13	-0.03	-0.02	-0.07	-0.01	0.17	0.05	1.00																		
16	Percentage of Population Under 25 YOA	0.17	0.17	-0.13	-0.03	-0.00	-0.06	-0.10	-0.04	-0.06	-0.04	0.00	0.04	0.25	0.11	0.21	1.00																	
17	Percentage of Pop (over 16) Unemployed	0.20	0.19	-0.15	-0.04	-0.06	-0.12	-0.18	-0.10	-0.03	-0.06	-0.03	0.02	0.27	0.17	0.30	0.46	1.00																
18	Percentage of Pop (over 25) with Bachelors Degree	0.27	0.25	0.03	0.02	-0.02	0.05	0.07	0.05	-0.05	-0.04	-0.11	-0.01	-0.12	-0.09	-0.17	-0.13	-0.33	1.00															
19	Percentage of Population Living below Poverty Line	0.01	0.02	-0.08	-0.02	-0.06	-0.12	-0.16	-0.11	0.00	-0.01	0.04	0.03	0.23	0.13	0.47	0.44	0.62	-0.50	1.00														
20	Per capita income in 1999	0.15	0.13	0.06	0.02	0.01	0.04	0.09	0.04	-0.04	-0.04	-0.11	-0.05	-0.20	-0.15	-0.20	-0.37	-0.40	0.60	-0.59	1.00													
21	Median household income in 1999	0.16	0.14	0.02	0.01	0.01	0.06	0.10	0.06	-0.05	-0.04	-0.12	-0.05	-0.20	-0.14	-0.25	-0.18	-0.42	0.75	-0.70	0.88	1.00												
22	Population density (pop/area)	0.25	0.20	-0.02	0.04	-0.10	-0.05	-0.03	-0.04	-0.03	-0.03	-0.18	0.00	0.11	0.04	0.10	0.02	0.17	0.11	0.05	0.11	0.08	1.00											
23	Percentage of Housing Vacant	-0.25	-0.21	0.02	-0.03	0.09	-0.02	-0.01	-0.00	0.04	-0.04	0.11	-0.01	-0.11	0.04	-0.02	-0.26	0.05	-0.20	0.20	-0.15	-0.31	-0.21	1.00										
24	Percentage of Pop described as Urban	0.54	0.48	-0.03	0.03	-0.12	-0.02	-0.03	0.01	-0.05	0.05	-0.13	0.04	0.32	0.19	0.12	0.16	0.12	0.35	-0.10	0.26	0.27	0.37	-0.43	1.00									
25	Mission Complexity Scale	0.35	0.40	-0.01	0.01	0.00	-0.04	-0.01	-0.03	-0.03	-0.10	-0.03	-0.15	-0.05	-0.16	-0.05	0.00	-0.03	0.07	-0.06	0.04	0.06	-0.04	-0.04	0.03	1.00								
26	Formalization of rules and policies	0.42	0.40	-0.10	0.00	-0.09	-0.04	-0.04	-0.02	0.00	-0.02	-0.12	0.05	0.19	0.12	0.07	0.07	0.07	0.22	-0.08	0.18	0.20	0.15	-0.15	0.36	0.19	1.00							
27	Organizational Height	0.66	0.64	0.04	0.04	-0.00	-0.07	-0.05	-0.05	-0.03	-0.01	-0.13	-0.05	0.15	-0.03	0.20	0.00	0.10	0.24	0.02	0.16	0.16	0.20	-0.15	0.26	0.21	0.28	1.00						
28	Decentralization (Population per Offices)	0.40	0.44	-0.03	0.00	-0.02	-0.01	-0.04	-0.01	-0.08	-0.05	-0.07	-0.13	0.01	-0.12	0.05	0.10	0.02	0.14	-0.06	0.08	0.11	0.02	-0.14	0.16	0.10	0.14	0.21	1.00					
29	Number of Police Facilities	0.54	0.54	-0.04	0.01	-0.03	-0.05	-0.10	-0.02	-0.04	-0.06	-0.09	-0.04	0.14	0.01	0.20	0.09	0.16	0.06	0.11	0.00	-0.03	0.07	-0.05	0.16	0.21	0.16	0.34	0.04	1.00				
30	Percentage of Comm. Police Officers	-0.24	-0.24	-0.02	0.01	0.01	-0.01	-0.02	-0.01	0.05	0.01	0.02	0.05	-0.06	0.06	-0.05	-0.07	-0.08	-0.05	0.02	-0.02	-0.04	-0.05	0.11	-0.17	-0.04	-0.05	-0.18	-0.13	-0.05	1.00			
31	Use of Comm Policing Strategies	0.56	0.53	-0.03	0.02	-0.10	-0.04	-0.03	-0.02	-0.06	-0.03	-0.14	0.10	0.28	0.11	0.09	0.10	0.11	0.23	-0.02	0.09	0.10	0.18	-0.16	0.37	0.25	0.42	0.35	0.12	0.32	0.04	1.00		
32	Technology for Field Use	0.63	0.62	-0.05	0.02	-0.12	0.00	-0.03	0.03	-0.06	0.01	-0.16	0.01	0.26	0.09	0.00	0.09	0.01	0.36	-0.20	0.25	0.29	0.18	-0.27	0.46	0.30	0.40	0.39	0.23	0.29	-0.10	0.55	1.00	
33	Technology for Investigations	0.58	0.58	-0.02	0.04	-0.08	0.00	-0.01	0.01	-0.01	0.01	-0.08	0.05	0.25	0.10	0.01	0.07	0.02	0.29	-0.15	0.20	0.23	0.11	-0.19	0.39	0.37	0.42	0.38	0.17	0.27	-0.10	0.55	0.61	1.00

Also as anticipated, the study found correlation between several of the income and fiscal measurement variables. For example, median household income is highly correlated with the percentage of population with a bachelors degree (0.8), percentage of the population unemployed (-0.7), and per capita income (0.9). In addition, there is significant correlation between the percentage of population living below poverty line and both the percentage of the population unemployed (0.6), and median household income (-0.7). Because the study theorizes that the percentage of the population in poverty is a proxy measure for both a general level of community economic health and as measure of community support, the analysis includes the percentage of the population in poverty. The regression analysis will omit percentage of the population unemployed and the median income variables. Percentage of population with a bachelor's degree is also correlated with the income variables, so omitting the income variables allows the study to continue including the percentage of population with bachelors degree.

Finally, several of the agency variables are also highly correlated to the size variables. Organizational height and number of sworn officers has a Pearson coefficient of 0.6. This high correlation is not unexpected, since larger organization often have more ranks or layers of supervision. The number of police facilities and technology variables are also highly correlated with both size variables. As a result, the study also omits the organizational height, number of police facilities and technology variables.

Prior to conducting the regression analysis, regression assumptions require checking the data for multicollinearity. Multicollinearity is the

intercorrelation of multiple independent variables. If there is excessive correlation, the standard errors of the b and beta coefficients become large. When that occurs, assessing the relative importance of the predictor variables becomes difficult. The preferred method of assessing multicollinearity is to regress each independent on all the other independent variables in the model, looking for high multiple R, typically greater than 0.8 (Garson, 2009). Two variables to exceed the 0.8 threshold, percentage of the population below poverty line (R = 0.817) and log of population density (R = 0.813). As a result, the analyses will exclude the population density variable. Rerunning the regression of the independent variables against the all the other variables without population density results in all multiple R's being less then 0.8.

Any regression analysis assumes that the underlying distribution for all variables is normal. The descriptive statistics also include a measure of skewness. The skewness measure indicates that several of the variables may not be normally distribute. Variables that are normally distributed will have a value of 0. Values beyond 2 or -2 indicate excessive skewness and may violate a critical assumption of linear regression. For variables whose distribution may be excessively skewed, the actual distribution can be observed and skewness can be confirmed with a histogram of the variable. For variables that are not normally distributed, transformations, such as log or square root, can force a normal distribution without negating or altering the variables contribution to the analysis.

Several of the clearance variables have skewness values that indicated excessive skewness. Burglaries, larcenies, and vehicle thefts typically have low clearance rates, with most agencies clearing less than 30% of these crimes. As a

result, there is typically a positive skewing to the distribution of these values. The dependent variables adjusted percentage of burglaries cleared, adjusted percentage of larcenies cleared, and adjusted percentage of vehicle thefts cleared are transformed by taking the square root of the adjusted values, forcing a normal distribution. Similarly, the analysis will also use the log of the demographic variable percentage of population African American or black, and percentage of housing vacant. Finally, the study will use the log of the department related variables decentralization, number of police facilities, and percentage of community police officers. Any variables that are transformed that have a minimum value of 0 are adjusted prior to taking the log by adding 1 to all values.

Table 4 is a correlation table showing all the independent variables the study includes in the analysis of each of the crime categories. The variables are in their transformed form where appropriate. Save for one variable, all the correlations are well below the 0.6 threshold. However, after taking the log of the decentralization variable, the decentralization variable now correlates with both the log of the total sworn officers (0.72) and log of the total employee (0.75). While this exceeds the previously discussed threshold, having a single variable above this level may not be a problem (Garson, 2009). Considering the multicollinearity diagnostics do not indicate there is a problem and since only one variable exceeds 0.6, but does not exceed 0.9, the decentralization variable will be included.

As a result, the regression analyses will include the workload variable caseload (total reported crimes per total sworn officers) when examining the

TABLE 4: Correlations - Study Variables

	Correlations of all the study's included independent variables, in the final (transformed) form.													
	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Log of Total Sworn	1.000													
2	Log of the Total Employees	0.980	1.000												
3	Caseload (total crimes per total sworn	0.330	0.313	1.000											
4	Log of the Percentage of Pop Black	0.432	0.403	0.240	1.000										
5	Percent. of Population Under 25 YOA	0.168	0.166	0.245	0.206	1.000									
6	Percent. of Pop (over 25) with Bach. Degree	0.271	0.251	-0.123	-0.099	-0.134	1.000								
7	Percentage of Population Living	0.013	0.017	0.233	0.385	0.440	-0.496	1.000							
8	Log of the Housing Vacancy	-0.260	-0.212	-0.037	0.015	-0.170	-0.396	0.402	1.000						
9	Percentage of Pop described as Urban	0.544	0.485	0.324	0.249	0.162	0.347	-0.097	-0.483	1.000					
10	Mission Complexity Scale	0.348	0.399	-0.046	0.022	0.003	0.069	-0.085	-0.040	0.034	1.000				
11	Formalization of rules and policies	0.415	0.402	0.192	0.150	0.072	0.218	-0.082	-0.189	0.358	0.192	1.000			
12	Log of Decentralization	-0.719	-0.754	-0.212	-0.197	-0.163	-0.227	0.124	0.307	-0.371	-0.308	-0.304	1.000		
13	Log of Percnt of Comm. Police Officers	-0.071	-0.081	0.018	-0.026	-0.023	0.012	0.009	0.005	-0.020	0.029	0.052	0.165	1.000	
14	Use of Comm. Policing Strategies	0.558	0.535	0.292	0.185	0.101	0.229	-0.017	-0.202	0.369	0.262	0.422	-0.305	0.194	1.000

impact of agency size on clearance rates. The study also includes a total of six demographic and community control variables: the log of the percentage of population African American or black, the percentage of the population under 25, the percentage of the population with bachelor's degree, percentage of the population living below the poverty line, log of the percentage of housing vacant, and the percentage of the population described as urban. These variables cover the range of potential individual and community factors that can influence or effect agency clearance rates. Finally, the analysis will include agency related variables, including a mission complexity scale (representing the number if unique functions or services provided), formalization or rules and regulations, log of decentralization (police facilities per 10000), log of the percentage of officers designated as community police officers, and use of community policing strategies.

To accomplish this, the study employees SPSS's statistical analysis software to conduct a hierarchical multiple linear regression for each crime category. Each analysis will produce three models. The regression analysis develops the first model by entering the control variables related to workload and demographics. The second model then enters the department related variables. The third model then introduces study's independent variable to determine the effect of size, holding the other variables constant. The remainder of this chapter contains a summary of each of those analyses, broken down by crime type.

Murder

The first crime type the study analyzes is murder. Crimes in the UCR murder category actually consists of murder and nonnegligent manslaughter,

which the FBI defines as the willful (nonnegligent) killing of one human being by another (United States Department of Justice, 2004). The category does not include suicides, accidental deaths, fetal deaths, traffic fatalities, or attempted murder (which the FBI considers an aggravated assault). As previously discussed, the first step in the analysis is to use SPSS's statistical analysis software to perform multiple regression to develop a model of the seven community and workload control variables (Model 1). Model 1 is significant at the 0.01 level and is significantly better at predicting the percentage of murders cleared than utilizing the variable's mean value. The only variable that is significant is the percent of the population under 25 years of age.

The second phase of the analysis introduces agency related variables to create Model 2. The agency related variables are able to create a significant model at the 0.01 level. While it is significant, Model 2 explains a very small amount of the variation and has an adjusted R-squared of 0.019. In addition to the percentage of the population under 25, the formalization variable has a standardized beta value of -0.12 and is significant at the 0.01 level. None of the other agency related variables are significant.

The final phase of the analysis adds the size variable (sworn officer) to regression to create Model 3. The resulting model is significant (although the level is reduced to the 0.05 level), however the addition of the size variable is not significant. The adjusted R-squared change is 0.001 and the adjusted R-squared for Model 3 actually decreases to 0.018. Table 5 summarizes the results of these analyses.

TABLE 5: Regression Summary for Murder and Sworn Officers

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Murders Cleared (n = 1054)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*B*	*B*	*SE B*	*β*
(Constant)	99.60	12.67		122.74	15.51		122.80	15.51	
Caseload	0.00	0.08	0.00	0.01	0.08	0.00	0.00	0.08	0.00
% Population Black	-1.56	1.05	-0.05	-1.49	1.05	-0.05	-1.79	1.10	-0.06
% Population Under 25	-0.75	0.26	-0.11**	-0.70	0.26	-0.10**	-0.68	0.27	-0.10**
% Population Bac. Deg.	-0.01	0.21	0.00	0.05	0.21	0.01	0.03	0.22	0.01
% Population in Poverty	-0.07	0.24	-0.01	-0.14	0.24	-0.03	-0.16	0.24	-0.03
% Vacant Housing	0.31	2.67	0.00	0.31	2.69	0.00	0.13	2.70	0.00
% Population Urban	-0.01	0.06	0.00	0.04	0.06	0.02	0.02	0.06	0.01
Mission Complexity				-0.11	0.30	-0.01	-0.17	0.31	-0.02
Formalization				-1.73	0.54	-0.11***	-1.79	0.54	-0.11***
Decentralization				0.97	1.20	0.03	1.61	1.40	0.05
% Community Officers				0.29	0.94	0.01	0.32	0.94	0.01
Comm. Pol. Strategies				0.08	0.22	0.01	0.01	0.23	0.00
Sworn Officers							1.28	1.45	0.04
Adjusted R^2	0.012			0.019			0.019		
F	2.85**			2.69***			2.54**		
F for change in R^2				2.45*			0.78		

*p < 0.05 **p < 0.01 *** p < 0.001

As shown in Table 5, the only control variables to exhibit any significant influence are population under 25 and formalization. The unstandardized coefficients for both significant variables are negative, indicating an inverse relationship between the percentage of the population under 25 and murder clearances and the number of rules and policies and murder clearances. Model 3 introduces the independent variable, sworn officers. Once again, the model is significant, but the size variable is not. The unstandardized coefficient for size is positive, indicating a direct relationship between size and clearance rates, however the lack of significance makes drawing conclusions ill-advised.

The diagnostic statistics and plots support the assessment that the analysis violates no critical assumptions. Using the log of size variable

transforms the distribution of the independent variable to a normal distribution. Both the histogram (essentially normal) and P-P plot (closely follow the 45-degree diagonal) of the residuals confirm the assumption of normality of the error term. The plot of the residuals and the predicted values shows there is generally good scatter, with a distinct upper and lower bound.

The second analysis conducted for murder clearances uses the total number of employees as the independent variable. The results of this analysis are similar to the analysis using total number of sworn officers. Table 6 shows the results of the murder clearances and total employees analysis. Once again, regression Model 1 is significant, with the percentage of the population under 25 being the only significant community variable. Model 2 improves the adjusted R-square value and the significance increases to the 0.001 level. Like the sworn officer model, formalization is the only significant agency related variable. Adding the size variable produces a significant model (Model 3), however the change associated with the size variable is not significant. The adjusted R-square is actually reduced when the size variable is included In the regression model. Table 6 summarizes the results of the total employees and murder clearance rates analysis.

As shown in Table 6, only one control variable in Model 1, the percentage of the population under 25, is significant at the 0.01 level. Model 1 has an adjusted R-square of 0.012. Adding the agency control variables does improve the predictive ability of the model (Model 2). In addition to the community variable, formalization is also significant variable (at the 0.001 level). The unstandardized coefficient for both population under 25 and formalization are

TABLE 6: Regression Summary for Murder and Total Employees

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Murders Cleared (n = 1054)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	99.60	12.67		122.74	15.51		122.86	15.51	
Caseload	0.00	0.08	0.00	0.01	0.08	0.00	0.00	0.08	0.00
% Population Black	-1.56	1.05	-0.05	-1.49	1.05	-0.05	-1.70	1.09	-0.05
% Population Under 25	-0.75	0.26	-0.11**	-0.70	0.26	-0.10**	-0.69	0.26	-0.10**
% Population Bac. Deg.	-0.01	0.21	0.00	0.05	0.21	0.01	0.03	0.22	0.01
% Population in Poverty	-0.07	0.24	-0.01	-0.14	0.24	-0.03	-0.16	0.24	-0.03
% Vacant Housing	0.31	2.67	0.00	0.31	2.69	0.00	0.04	2.71	0.00
% Population Urban	-0.01	0.06	0.00	0.04	0.06	0.02	0.02	0.06	0.02
Mission Complexity				-0.11	0.30	-0.01	-0.18	0.31	-0.02
Formalization				-1.73	0.54	-0.11***	-1.78	0.54	-0.11***
Decentralization				0.97	1.20	0.03	1.61	1.46	0.05
% Community Officers				0.29	0.94	0.01	0.31	0.94	0.01
Comm. Pol. Strategies				0.08	0.22	0.01	0.02	0.23	0.00
Total Employees							1.10	1.44	0.04
Adjusted R^2	0.012			0.019			0.018		
F	2.85**			2.69***			2.53**		
F for change in R^2				2.45**			0.58		

*p < 0.05 **p < 0.01 *** p < 0.001

negative, indicating inverse relationships with clearance. The adjusted R-square for Model 2 improves to 0.019. In Model 3, adding the size variable (total employees) produces a significant model, however, the change associated with the addition of the size variable is not significant. The change in R-square is very small (0.001) and the adjusted R-square for model 3 (0.018) is slightly less than the adjusted R-square for model 2. In addition, like the analysis of the impact of the sworn officers, the coefficient for the size variable is positive, although the lack of significance makes drawing any conclusions inappropriate.

The diagnostic statistics and plots support the assertion that the analysis violates no critical assumptions. The histogram, which is essentially normal and

the P-P plot of the residuals, which closely follows the 45-degree diagonal, confirm the assumption of normality of the error term. A plot of the residuals and the predicted values shows there is generally good scatter, with a distinct upper and lower bound. Additionally, the values of the partial and part correlations do not drop sharply from the zero-order correlation, confirming that multicollinearity is not a significant problem. The other check for high multicollinearity involves checking tolerances and the variation inflation factor (VIF). Tolerances close to zero (approaching 0.2) and a variance inflation factor greater than 2 are indicative of a potential problem that could result in an inflated standard error of the regression coefficients. While there is no hard and fast cutoff value, researchers often use VIF values of 4 or 5 as a cut off. With strong models, VIF's as high as 10 may be acceptable (Garson, 2009). In this analysis, the tolerances are all close to 1 and all the VIF values are below 2 except for the percentage of the population in poverty, which is 2.5. While potentially problematic, testing the variable for multicollinearity by regressing it against the other independent variables confirms that there is not a significant collinearity problem. Re-running the analysis without the poverty variable does not change the regression outcome. Using a tolerance value of 0.2, also confirms that collinearity is not a significant issue.

Rape

The second category of crime analyzed is rape, using both total number of sworn officers and total employees as the independent variable. For the purpose of UCR reporting, the FBI defines rape as the carnal knowledge of a female forcibly and against her will (United States Department of Justice, 2004). The first

analysis in the rape category follows the same pattern as the murder analysis and begins by examining the role of total number of sworn officers in rape clearance rates. In the first phase, multiple regression develops a significant model using community and caseload variables and is shown as Model 1 in Table 7. The model is significant at the 0.05 level, however only two control variables contribute significantly to the model. Caseload is significant at the 0.01 level and the percentage of the population that is black is significant at the 0.05 level. The analysis creates model 2 by adding the agency related variables. Model 2 is significant at the 0.05 level, however none of the agency variables contributes significantly. Caseload and percentage of the population that is black variables remain significant. The final step is to create Model 3 by entering the size variable (sworn officers). Model 3 is significant at the 0.05 level. Table 7 summarizes the results.

As shown in Table 7, all of the models are significant, however the models have a small R-squared and explain less than 1% of the variance. Adding the agency variables and size variable actually causes the R-square to drop. Unlike murder, the size variable has a negative coefficient, but once again, inclusion of the size variable did not improve the model. In the final model, only caseload and the percentage of the population that is black contribute significantly, at the 0.01 to the 0.05 levels respectively. No other variables contribute significantly to the models.

In the final model, there is a negative relationship between caseload and the percentage of rapes cleared and a positive relationship between percentage

TABLE 7: Regression Summary for Rape and Sworn Officers

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Rapes Cleared (n = 1744)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	51.69	8.03		53.32	10.01		53.51	10.01	
Caseload	-0.18	0.06	-0.08**	-0.19	0.06	-0.08**	-0.18	0.06	-0.08**
% Population Black	1.64	0.73	0.06*	1.68	0.73	0.06*	2.00	0.79	0.07*
% Population Under 25	-0.19	0.17	-0.03	-0.17	0.17	-0.03	-0.19	0.17	-0.03
% Population Bac. Deg.	-0.09	0.14	-0.02	-0.09	0.14	-0.02	-0.07	0.14	-0.02
% Population in Poverty	-0.03	0.17	-0.01	-0.05	0.17	-0.01	-0.03	0.17	-0.01
% Vacant Housing	-0.61	1.68	-0.01	-0.57	1.69	-0.01	-0.39	1.70	-0.01
% Population Urban	0.05	0.03	0.04	0.05	0.04	0.05	0.06	0.04	0.06
Mission Complexity				-0.02	0.20	0.00	0.04	0.21	0.01
Formalization				-0.22	0.35	-0.02	-0.19	0.35	-0.01
Decentralization				0.29	0.81	0.01	-0.37	1.00	-0.01
% Community Officers				0.74	0.60	0.03	0.69	0.60	0.03
Comm. Pol. Strategies				0.10	0.16	0.02	0.17	0.17	0.03
Sworn Officers							-1.23	1.08	-0.05
Adjusted R^2	0.007			0.005			0.005		
F	2.63**			1.77*			1.74*		
F for change in R^2				0.59			1.30		

*p < 0.05 **p < 0.01 *** p < 0.001

of the population that is black and the percentage of rapes cleared. That is, as department caseloads increase, the percentage of rapes cleared decreases. In addition, as the percentage of the jurisdiction's population that is black increases, rape clearances increase.

When running the analysis a second time, this time with the total number employees as the independent size variable, the results are similar to those of total sworn officers. Table 8 summarizes the results of this analysis. Once again, caseload and percentage of the population that is black are the only control variables that are significant in the control variable model (Model 1). The addition of the agency variables adds nothing, and actually reduce the adjusted

TABLE 8: Regression Summary for Rape and Total Employees

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Rapes Cleared (n = 1744)

Variable	Model 1			Model 2			Model 3		
	B	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	51.69	8.03		53.32	10.01		53.60	10.02	
Caseload	-0.18	0.06	-0.08**	-0.19	0.06	-0.08**	-0.18	0.06	-0.08**
% Population Black	1.64	0.73	0.06*	1.68	0.73	0.06*	1.94	0.77	0.07*
% Population Under 25	-0.19	0.17	-0.03	-0.17	0.17	-0.03	-0.18	0.17	-0.03
% Population Bac. Deg.	-0.09	0.14	-0.02	-0.09	0.14	-0.02	-0.07	0.14	-0.02
% Population in Poverty	-0.03	0.17	-0.01	-0.05	0.17	-0.01	-0.03	0.17	-0.01
% Vacant Housing	-0.61	1.68	-0.01	-0.57	1.69	-0.01	-0.31	1.71	-0.01
% Population Urban	0.05	0.03	0.04	0.05	0.04	0.05	0.06	0.04	0.05
Mission Complexity				-0.02	0.20	0.00	0.06	0.22	0.01
Formalization				-0.22	0.35	-0.02	-0.19	0.35	-0.01
Decentralization				0.29	0.81	0.01	-0.44	1.05	-0.01
% Community Officers				0.74	0.60	0.03	0.69	0.61	0.03
Comm. Pol. Strategies				0.10	0.16	0.02	0.16	0.17	0.03
Total Employees							-1.16	1.06	-0.05
Adjusted R^2		0.007			0.005			0.005	
F		2.63**			1.77*			1.73*	
F for change in R^2					0.59			1.20	

*p < 0.05 **p < 0.01 *** p < 0.001

R-square of Model 2. Adding total employees has no effect on the adjusted R-squared but Model 3 remains significant at the 0.05 level.

The results of the total employees models are similar to the analysis of sworn officers. In all three models, caseload and percentage of the population that is black are the only variables that are significant. The addition of agency related variables and the size variable actually reduce the significance of the model. The size has a positive coefficient but does not contribute significantly to the model. In the analysis of the percentage of rapes cleared, size of the agency, as measured by sworn officers or total employees, does not significantly affect the models of the percentage of rapes cleared. For both size variables, the

diagnostic statistics are similar to the murder analysis, indicating the regression violates none of the critical assumptions.

Robbery

The third category of crime analyzed is robbery. Robbery involves a theft or larceny, aggravated by the element of force or threat of force. The FBI defines robbery as the taking or attempting to take anything of value from the care, custody, or control of a person or persons by force or threat of force or violence and/or by putting the victim in fear (United States Department of Justice, 2004).

Using the community and workload control variables, Model 1 is a significant model at the 0.001 level. Two of the seven potential control variables are significant: percentage of population that is black (at the 0.001 level) and percentage of the population that is urban (at the 0.01 level). Model 2 adds the agency variables and is also a significant model at the 0.001 level. The only agency related variable that is significant is decentralization (at the 0.01 level), although the community variables the percentage of the population that is black and that is urban remain significant. The final phase of the analysis involves adding the size variable. As shown in Table 9, Model 3 is significant and the addition of the size variable, the number of sworn offices, is also significant, although the relationship is not in the direction the study hypothesizes.

Model 1 explains approximately 5% of the variance, with an adjusted R-square of 0.052. The addition of the agency variables in Model 2, creates a significant model, however, the model only slightly improves upon model 1's ability to predict, with a change in adjusted R-square of 0.005. The F change is

TABLE 9: Regression Summary for Robbery and Sworn Officers

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Robberies Cleared (n = 1741)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	50.91	6.62		54.71	8.16		55.06	8.15	
Caseload	-0.22	0.05	-0.11***	-0.20	0.05	-0.10***	-0.19	0.05	-0.10***
% Population Black	-3.72	0.60	-0.16***	-3.51	0.60	-0.15***	-2.95	0.64	-0.13***
% Population Under 25	-0.06	0.14	-0.01	0.02	0.14	0.00	0.00	0.14	0.00
% Population Bac. Deg.	-0.09	0.11	-0.02	-0.03	0.11	-0.01	0.01	0.11	0.00
% Population in Poverty	-0.04	0.14	-0.01	-0.12	0.14	-0.03	-0.09	0.14	-0.02
% Vacant Housing	3.42	1.38	0.08*	3.35	1.38	0.08*	3.69	1.39	0.08**
% Population Urban	-0.05	0.03	-0.05	-0.03	0.03	-0.03	-0.01	0.03	-0.01
Mission Complexity				0.06	0.16	0.01	0.16	0.17	0.03
Formalization				-0.52	0.29	-0.05	-0.45	0.29	-0.04
Decentralization				1.80	0.65	0.07**	0.54	0.81	0.02
% Community Officers				-0.44	0.49	-0.02	-0.53	0.50	-0.03
Comm. Pol. Strategies				-0.02	0.13	0.00	0.11	0.14	0.02
Sworn Officers							-2.28	0.87	-0.11**
Adjusted R^2	0.052			0.057			0.060		
F	14.73***			9.76***			9.57***		
F for change in R^2				2.70*			6.94**		

*p < 0.05 **p < 0.01 *** p < 0.001

significant at the 0.05 level. In Model 3, the adjusted R-square change associated with the addition of the size variable is significant although the improvement is small. Model 3 has an adjusted R-square of 0.060.

In model 2, the relationship between two of the significant control variables, caseload and the percentage of the population that is black, and the percentage of robberies cleared is negative. These predict that as an agency's caseload increases, the percentage of robberies cleared will decrease. Also, as the percentage of the jurisdiction's population that is black increases, the percentage of robberies cleared will decreases. The relationship between both the housing vacancy rate and robbery clearance and decentralization and robbery

clearance is positive. That is, as either variable increases, the percentage of robberies cleared will also increase.

Adding the agency size variable creates model 3. The coefficient of the standardized beta variable for agency size also has a negative relationship, indicating that while holding the other control variable constant, robbery clearance rates decrease as the size of the department increases. In the final model (model 3), percentage of the population that is black, percentage under 25 and the housing vacancy rate are significant. In model 3, the control variable decentralization is no longer significant. The decentralization variable had been significant in model 2 (at the 0.05 level) is not significant when size is added. This suggests that size may be a mediator for decentralization. Several other crime categories (but not all) experienced a similar decrease in the relationship between decentralization when adding the size variable.

Conducting a similar regression analysis using the total number of employees as the independent variable results in a similar outcome. Each of the models has the same significant variables and each has nearly identical adjusted R-squared and similar standardized and unstandardized coefficients. The coefficients of the total employee variable are similar to the coefficients of the sworn officers variable in the first analysis, indicating a similar relationship exists. For both analyses, the relationship between size and the percentage of robberies cleared is negative, predicting that as agency size increases, the percentage of robberies cleared decreases. Table 10 summarizes the results of these regressions.

TABLE 10: Regression Summary for Robbery and Total Employees

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Robberies Cleared (n = 1741)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	50.91	6.62		54.71	8.16		55.20	8.15	
Caseload	-0.22	0.05	-0.11***	-0.20	0.05	-0.10***	-0.19	0.05	-0.10***
% Population Black	-3.72	0.60	-0.16***	-3.51	0.60	-0.15***	-2.98	0.63	-0.13***
% Population Under 25	-0.06	0.14	-0.01	0.02	0.14	0.00	0.01	0.14	0.00
% Population Bach. Deg.	-0.09	0.11	-0.02	-0.03	0.11	-0.01	0.01	0.11	0.00
% Population in Poverty	-0.04	0.14	-0.01	-0.12	0.14	-0.03	-0.09	0.14	-0.02
% Vacant Housing	3.42	1.38	0.08*	3.35	1.38	0.08*	3.92	1.40	0.09*
% Population Urban	-0.05	0.03	-0.05	-0.03	0.03	-0.03	-0.01	0.03	-0.01
Mission Complexity				0.06	0.16	0.01	0.20	0.17	0.03
Formalization				-0.52	0.29	-0.05	-0.45	0.29	-0.04
Decentralization				1.80	0.65	0.07**	0.27	0.85	0.01
% Community Officers				-0.44	0.49	-0.02	-0.53	0.49	-0.03
Comm. Pol. Strategies				-0.02	0.13	0.00	0.11	0.14	0.02
Total Employees							-2.39	0.85	-0.12**
Adjusted R^2	0.052			0.057			0.061		
F	14.73***			9.58***			9.63***		
F for change in R^2				2.70*			7.81**		

*p < 0.05 **p < 0.01 *** p < 0.001

Once again, the role of size is significant and has a negative relationship, predicting that, as the size of an agency as measured by total employees increases, the percentage of robberies cleared will decrease. The role of caseload, percentage of the population that is black, and housing vacancy rate continue to be significant. None of the agency related control variables are significant. Finally, the diagnostic statistics and plots support the assertion that the analyses violate no critical assumptions.

Assaults

The fourth category of crime this study analyzes is assault, which includes assaults and attempts to kill or murder. All assaults by one person upon another

with the intent to kill, maim, or inflict severe bodily injury with the use of any dangerous weapon are classified as aggravated assault by the FBI (United States Department of Justice, 2004). The FBI does not require that injury result from an aggravated assault when a gun, knife, or other weapon that could cause serious personal injury is used. The FBI breaks down assaults by category, to include assaults with a firearm, assaults with a knife or cutting instrument, assaults with other dangerous weapon or assaults with hands, fists, or feet. The FBI also collects statistics on simple assaults, which are essentially assaults that the police cannot classify as aggravated assaults.

Because police departments might place different levels of importance on simple versus felony assaults, the study breaks down the analysis into several sub-analyses. This means the study will analyze the clearance rates for all assaults as a single category, but also examine the clearance rates for simple and felony (aggravated) individually. The total number and clearance statistics associated with felony assaults are easily calculable by subtracting the number of simple assaults from total assaults. The study does not consider the sub categories of felony assaults (firearm, knife or hands and feet), but instead aggregates them into a total assault and total felony assault variable. For police agencies, it is unlikely that nature of the assault (assault with a knife versus assault with a firearm) would generate a different level of response from the investigators. It is likely that investigators would investigate all felonious assaults with the same effort and vigor. The same cannot always be said for minor or simple assaults. Because they lack serious injury and do not involve the use if a weapon, police may not dedicate the resources they would for an assault the

results in serious physical injury. Because of this, the study looks at the impact of size on all reported assaults, as well as on felony and simple assaults separately.

In the assault category, the first analysis conducted examines the impact of agency size on the percentage of all assaults cleared. Regression creates Model 1 by first entering the community and workload variables. The resulting model is significant (at the 0.001 level) with four variables (caseload, population that is black, population in poverty and population that is considered urban) being significant. Adding the agency variables to the regression analysis creates Model 2. This model is also significant at the 0.001 level and in addition to the community and caseload variables, the mission complexity and decentralization variables are also significant. The change associated with the addition of the agency variables is significant. Finally, the study adds the size variable sworn officer to create Model 3. While the overall model is significant, the size variable and the changes associated with its addition to the model is not. The two agency variables that had been significant are no longer significant, while a third variable, community policing strategies, is significant. Table 11 summaries the results of this first analysis.

The coefficients for the percentage of the population that is black, the percentage of the population in poverty and caseload are negative, indicating that as each one increases, the percentage of assaults cleared decreases. The coefficient for percentage of the population considered urban is positive, which predicts clearance rates increase as percentage of the population that is urban increases. When adding the agency variables, regression creates a significant

TABLE 11: Regression Summary for Assault and Sworn Officers

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Assaults Cleared (n = 2193)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	69.49	4.86		73.73	5.85		74.27	5.86	
Caseload	-0.27	0.04	-0.17***	-0.27	0.04	-0.17***	-0.27	0.04	-0.17***
% Population Black	-2.06	0.46	-0.11***	-1.87	0.46	-0.10***	-1.63	0.50	-0.08**
% Population Under 25	0.09	0.11	0.02	0.13	0.11	0.03	0.13	0.11	0.03
% Population Bac. Deg.	-0.11	0.08	-0.03	-0.11	0.09	-0.03	-0.09	0.09	-0.03
% Population in Poverty	-0.22	0.10	-0.07*	-0.28	0.10	-0.08**	-0.27	0.11	-0.08*
% Vacant Housing	0.16	1.02	0.00	0.04	1.02	0.00	0.15	1.02	0.00
% Population Urban	0.04	0.02	0.06*	0.04	0.02	0.06*	0.05	0.02	0.07*
Mission Complexity				-0.23	0.12	-0.05*	-0.20	0.12	-0.04
Formalization				-0.06	0.20	-0.01	-0.04	0.20	0.00
Decentralization				1.31	0.49	0.07**	0.81	0.61	0.04
% Community Officers				-0.43	0.35	-0.03	-0.47	0.35	-0.03
Comm. Pol. Strategies				0.18	0.10	0.05	0.24	0.11	0.06*
Sworn Officers							-0.92	0.70	-0.06
Adjusted R^2	0.047			0.052			0.053		
F	16.50***			11.07***			10.36***		
F for change in R^2				3.35**			1.76		

*p < 0.05 **p < 0.01 *** p < 0.001

model at the 0.001 level (model 2). The mission complexity variable is significant at the 0.05 level and has a negative coefficient, indicating that as the number functions an agency provides increases, the percentage of assault clearances decreases. Decentralization is also significant at the 0.05 level and has a positive coefficient. As the number of facilities per 10,000 citizens increases, a strategy used to connect with the community and consistent with community policing, the percentage of assaults cleared would also increase. The use of community policing strategies also has a positive coefficient, with the significance approaching (0.076) but not reaching the 0.05 level. The change associated with the addition of the police agency variables is significant. Model 2 has an adjusted

R-squared of 0.052, which is an increase of 0.005 from Model 1's adjusted R-squared value of 0.047.

Model 3 is also significant. However, the F change associated with the addition of the size variable is not significant. The adjusted R-square is 0.053 and the coefficient of the size variable is not significant. In Model 3, the impact of the caseload and community variables are relatively unchanged from model 2, however several of the agency variables do experience a change in their level of significance. Both mission complexity and decentralization, which had been significant in model 2, are not significant in model 3. The standardized beta coefficient for mission complexity is reduced to -0.038 from -0.045 in model 2. The addition of the size variable reduces the t test significance from 0.049 to 0.105. The coefficient for the decentralization variable drops from 0.07 to 0.04 and the variable is not significant on model 3. This is similar to the change decentralization that occurred in the robbery analyses. The use of community policing strategies is significant after adding the size variable to the analysis. The use of community policing strategies has a negative coefficient, indicating an inverse relationship.

Conducting the analysis using the size variable, total number of employees, results in similar models to the models created with sworn officers. Once again, caseload, the percentage of the population that is black, percentage of the population in poverty, and the percentage of the population that is considered urban are significant. When adding the agency variables to create Model 2, mission complexity and decentralization are significant (at the 0.05 and 0.01 levels respectively). The adjusted R-square values for total employees are

similar to the adjusted R-square for sworn officers in all models. For total employees, model 1 has an adjusted R-square of 0.057 and model 2 has an adjusted R-square of 0.052. Using total employees, the final model (model 3) is significant. However, the model does not significantly improve upon Model 2's ability to predict the percentage of assaults cleared. The size variable is not significant, and the F change associated with the size variable is not significant. The adjusted R-square for model 3 does not change and remains 0.052. Table 12 summarizes the results of this analysis.

In the analyses of total employees and percentage of assaults cleared, there is a negative relationship between caseload, percentage of the population that is black, percentage in poverty, and the mission complexity variable and clearance rates. The percentage of the population that is urban, decentralization, and community policing strategies all have a positive coefficient. In both the analysis of sworn officers and total employees, the size variables have a negative coefficient. However, when controlling for the workload, community and agency variables, the effect is very small and is not statistically significant.

The second analysis in the assault category examines the effect of agency size on the percentage of aggravated or felony assaults. The felony assault category consists of the more serious assault, assaults that result in serious physical injury or involve the use of a weapon. Once again, the first phase involves creating a model with the community and caseload variables. That model (model 1) is a statistically significant at the 0.001 level. Like the analysis of all assaults, the control variables caseload, percentage of the population that is black, percentage of the population in poverty and percentage of the population

TABLE 12: Regression Summary for Assaults and Total Employees

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Assaults Cleared (n = 2193)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	69.49	4.86		73.73	5.85		74.10	5.86	
Caseload	-0.27	0.04	-0.17***	-0.27	0.04	-0.17***	-0.27	0.04	-0.17***
% Population Black	-2.06	0.46	-0.11***	-1.87	0.46	-0.10***	-1.72	0.49	-0.09***
% Population Under 25	0.09	0.11	0.02	0.13	0.11	0.03	0.13	0.11	0.03
% Population Bac. Deg.	-0.11	0.08	-0.03	-0.11	0.09	-0.03	-0.09	0.09	-0.03
% Population in Poverty	-0.22	0.10	-0.07*	-0.28	0.10	-0.08**	-0.27	0.11	-0.08*
% Vacant Housing	0.16	1.02	0.00	0.04	1.02	0.00	0.18	1.03	0.01
% Population Urban	0.04	0.02	0.06*	0.04	0.02	0.06*	0.05	0.02	0.07*
Mission Complexity				-0.23	0.12	-0.05*	-0.20	0.12	-0.04
Formalization				-0.06	0.20	-0.01	-0.05	0.20	-0.01
Decentralization				1.31	0.49	0.07**	0.88	0.65	0.05
% Community Officers				-0.43	0.35	-0.03	-0.46	0.35	-0.03
Comm. Pol. Strategies				0.18	0.10	0.05	0.22	0.11	0.06*
Total Employees							-0.67	0.69	-0.04
Adjusted R^2	0.047			0.052			0.052		
F	16.50***			11.07***			10.29***		
F for change in R^2				3.35**			0.94		

*p < 0.05 **p < 0.01 *** p < 0.001

considered urban are significant. Model 1 has an adjusted R-squared of 0.068.

The second phase of the analysis involves adding the agency variables to create Model 2. Model 2 is significant at the 0.001 level. However, the change associated with the addition of the agency variables in not significant, and the adjusted R-square increases slightly from 0.068 to 0.070. While caseload and the community variables impact does not change in model 2, of the agency variables, only the decentralization variable contributes significantly.

Adding the size variable sworn officers creates a significant model at the 0.001 level (Model 3). Model 3's adjusted R-square improves to 0.075. The caseload and community variables (percentage of the population that is black,

percentage of the population poverty and the percentage of population considered urban) remain significant, however the decentralization variable rate is no longer significant. Decentralization's standardized beta coefficient becomes zero in model 3. The size variable (sworn officers) is also significant at the 0.001 level. A negative coefficient indicates an inverse relationship, with the percentage of felony assaults cleared decreasing as the number of sworn officers increases. Table 13 summarizes these results.

Conducting a regression analysis using the size variable total employees as the independent variable yields similar results as sworn officers. In model 1, four control variables (caseload, percentage of the population that is black, percentage of the population in poverty and percentage of the population that is urban) contribute significantly to the model's ability to predict. There is a negative relationship between three of the four significant control variables (the exception is percentage considered urban which is positive) and the percentage of felony assaults cleared. That is, as agency caseloads increase, or the percentage of the population that is black or percentage of the population that is urban increases, the percentage of felony assaults cleared will decrease. Model 2 is also significant at the 0.001 level. However, the change associated with the addition of the agency variables is not significant and the adjusted R-square increases just slightly from 0.068 for model 1 to 0.070 for model 2. The only agency variable that contributes significantly to Model 2 is decentralization. Like the sworn officer analysis, the effect of decentralization disappears when the size variable total employees is added. Like previous analysis, this coefficient change implies that size may be a mediating variable. Adding the size variable total

TABLE 13: Regression Summary for Felony Assault and Sworn Officers

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Felony Assaults Cleared (n = 2099)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	77.85	5.19		79.26	6.27		80.46	6.27	
Caseload	-0.32	0.04	-0.19***	-0.30	0.04	-0.18***	-0.29	0.04	-0.17***
% Population Black	-2.40	0.48	-0.12***	-2.18	0.48	-0.11***	-1.55	0.52	-0.08**
% Population Under 25	-0.03	0.11	-0.01	0.01	0.11	0.00	-0.01	0.11	0.00
% Population Bac. Deg.	-0.10	0.09	-0.03	-0.06	0.09	-0.02	-0.02	0.09	0.00
% Population in Poverty	-0.26	0.11	-0.08*	-0.31	0.11	-0.09**	-0.28	0.11	-0.08*
% Vacant Housing	0.17	1.07	0.00	-0.03	1.08	0.00	0.28	1.08	0.01
% Population Urban	0.04	0.02	0.06*	0.05	0.02	0.07*	0.07	0.02	0.09**
Mission Complexity				-0.10	0.13	-0.02	0.00	0.13	0.00
Formalization				0.01	0.22	0.00	0.05	0.22	0.01
Decentralization				1.22	0.52	0.06*	-0.10	0.65	0.00
% Community Officers				-0.51	0.38	-0.03	-0.61	0.38	-0.04
Comm. Pol. Strategies				-0.04	0.11	-0.01	0.10	0.11	0.02
Sworn Officers							-2.43	0.72	-0.14***
Adjusted R^2	0.068			0.070			0.075		
F	22.80***			14.22***			14.06***		
F for change in R^2				2.12			11.34***		

*p < 0.05 **p < 0.01 *** p < 0.001

employees improves the model's ability to predict the percentage of felony assaults cleared, with the F change in adjusted R-squared being significant at the 0.001 level. In Model 3, the size variable is significant at the 0.001 level. The negative standardized beta coefficient indicates that as size increase, clearance rate of felony assaults decreases. Table 14 summarizes the results of this analysis.

Overall, using either sworn officers or total employees as the independent size variable creates a model that helps to explain approximately 8% of the variation in felony assaults cleared. For both size variables, the community and caseload variable model (model 1) explains the majority of variation. The

TABLE 14: Regression Summary for Felony Assaults and Total Employees

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Felony Assaults Cleared (n = 2099)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	77.85	5.19		79.26	6.27		80.29	6.27	
Caseload	-0.32	0.04	-0.19***	-0.30	0.04	-0.18***	-0.29	0.04	-0.17***
% Population Black	-2.40	0.48	-0.12***	-2.18	0.48	-0.11***	-1.63	0.51	-0.08***
% Population Under 25	-0.03	0.11	-0.01	0.01	0.11	0.00	0.00	0.11	0.00
% Population Bac. Deg.	-0.10	0.09	-0.03	-0.06	0.09	-0.02	-0.01	0.09	0.00
% Population in Poverty	-0.26	0.11	-0.08*	-0.31	0.11	-0.09**	-0.28	0.11	-0.08*
% Vacant Housing	0.17	1.07	0.00	-0.03	1.08	0.00	0.50	1.08	0.01
% Population Urban	0.04	0.02	0.06*	0.05	0.02	0.07*	0.06	0.02	0.09**
Mission Complexity				-0.10	0.13	-0.02	0.03	0.13	0.01
Formalization				0.01	0.22	0.00	0.05	0.22	0.01
Decentralization				1.22	0.52	0.06*	-0.28	0.69	-0.01
% Community Officers				-0.51	0.38	-0.03	-0.61	0.38	-0.04
Comm. Pol. Strategies				-0.04	0.11	-0.01	0.08	0.11	0.02
Total Employees							-2.36	0.72	-0.14***
Adjusted R^2	0.068			0.070			0.075		
F	22.80***			14.22***			14.02***		
F for change in R^2				2.12			10.90***		

*p < 0.05 **p < 0.01 *** p < 0.001

addition of agency variables does not significantly improve the model ability to predict felony assault clearance rates. While the addition of either size variable is significant, the change in the adjusted R-squared associated with the addition of the size variable is small, in both instances a little more than 1%.

The final analysis of the clearance rates for assaults involves the effect of size on the percentage of simple assaults cleared. The FBI considers simple assaults to be non-aggravated (not felony) assaults and includes all assaults which do not involve the use of a firearm, knife, cutting instrument, or other dangerous weapon and in which the victim did not sustain serious or aggravated injuries. The Uniform Crime Report actually considers simple assault as a Part II

offense. However, the FBI collects data as a quality control matter and for the purpose of looking at total assault violence (United States Department of Justice, 2004).

Using multiple linear regression, model 1 includes the community and caseload control variables and is significant at the 0.001 level. Model 1 has four control variables contributing significantly. The variables, percentage of the population that is back and caseload are significant at the 0.05 level, while the percentage of the population that is urban is significant at the 0.01 level and percentage of the population in poverty is significant at the 0.05 level. All the significant community and caseload variable except the percentage of the population that is urban, have a negative relationship to the percentage of simple assaults cleared. Adding the agency variables also creates a significant model (at the 0.001 level) and the F change (3.08) is significant at the 0.01 level. Model 2 has five variables that contribute significantly: caseload, percentage of the population that is black, percentage population urban, percentage of the population in poverty and decentralization. The standardized beta weights for decentralization are positive, suggesting a positive relationship between the number of police facilities and the clearance rate for simple assaults. The final step of the analysis involves adding the size variable sworn officers. The addition of the size variable does not contribute significantly to the new model (Model 3). While the overall model is significant, the F change (0.24) associated with the addition of the size variable is not significant. Table 15 summarizes the results of this analysis.

The final model (Model 3) is significant and the five control variables

TABLE 15: Regression Summary for Simple Assault and Sworn Officers

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Simple Assaults Cleared (n = 2170)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	64.41	5.23		66.63	6.33		66.84	6.34	
Caseload	-0.25	0.04	-0.15***	-0.25	0.04	-0.15***	-0.25	0.04	-0.15***
% Population Black	-1.90	0.49	-0.09***	-1.71	0.50	-0.08***	-1.61	0.54	-0.08**
% Population Under 25	0.16	0.11	0.04	0.21	0.11	0.05	0.20	0.11	0.05
% Population Bac. Deg.	-0.10	0.09	-0.03	-0.09	0.09	-0.03	-0.09	0.09	-0.03
% Population in Poverty	-0.25	0.11	-0.07*	-0.31	0.11	-0.09**	-0.31	0.11	-0.09**
% Vacant Housing	0.35	1.10	0.01	0.18	1.10	0.00	0.22	1.10	0.01
% Population Urban	0.05	0.02	0.07**	0.06	0.02	0.07**	0.06	0.02	0.08**
Mission Complexity				-0.16	0.13	-0.03	-0.15	0.13	-0.03
Formalization				-0.02	0.22	0.00	-0.01	0.22	0.00
Decentralization				1.58	0.53	0.08**	1.38	0.67	0.07*
% Community Officers				-0.49	0.38	-0.03	-0.50	0.38	-0.03
Comm. Pol. Strategies				0.20	0.11	0.05	0.23	0.12	0.05
Sworn Officers							-0.36	0.75	-0.02
Adjusted R^2	0.036			0.040			0.040		
F	12.49***			8.60***			7.96***		
F for change in R^2				3.08**			0.24		

*p < 0.05 **p < 0.01 *** p < 0.001

significant in Model 2 remain significant. The final model is similar to the analysis conducted using total assaults, except that the only agency variable that is significant is decentralization. For total assaults, use of community policing strategies is significant. In this analysis, the coefficient is positive, inferring that as decentralization increases, the percentage of simple assaults cleared also increases. These results are consistent with the effect of the agency variable in the total assault analysis.

Rerunning the analysis using the size variable total employees as the independent variable yields results similar to the sworn officer analysis. Model 1 is significant at the 0.001 level and has an adjusted R-square of 0.036. The same

variables are significant (at the same levels) in Models 1 and 2 that were significant in the analyses using sworn officers. With the addition of the size variable, the model remains significant, however the contribution of the total number of employees is extremely small and not significant. The F change associated with the addition of the agency variables is significant at the 0.01 level. The F change associated with the addition of the size variable is not significant. The adjusted R-square for model 2 increases to 0.040. The adjusted R-square for model 3 does not change (0.040). Table 16 summarizes the results of this analysis.

For simple assaults, the final models created by both analyses are significant. However, once again the addition of the size variable does not contribute to the models ability to predict the percentage of simple assaults cleared. Neither size variable is significant. For each of the assault categories, the regressions produced significant models, and several control variables were significant in each of the analysis. In each of the first models, the community variables percentage of the population that is black, the percentage of the population that is urban, and percentage of the population in poverty, as well as the caseload variable are significant. In each of the second models, decentralization contributes significantly in all six analyses. In the total assault analysis, the agency variable mission complexity also significantly contributes. However, when adding the size variable, only in the percentage of felony assaults cleared category does the size significantly improve the ability of the model to predict the clearance rate. For both simple assaults and total assaults, the addition of a size is not significant. The models that examine felony assaults

TABLE 16: Regression Summary for Simple Assault and Total Employees

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Simple Assaults Cleared (n = 2170)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	64.41	5.23		66.63	6.33		66.67	6.34	
Caseload	-0.25	0.04	-0.15***	-0.25	0.04	-0.15***	-0.25	0.04	-0.15***
% Population Black	-1.90	0.49	-0.09***	-1.71	0.50	-0.08***	-1.69	0.53	-0.08***
% Population Under 25	0.16	0.11	0.04	0.21	0.11	0.05	0.21	0.11	0.05
% Population Bac. Deg.	-0.10	0.09	-0.03	-0.09	0.09	-0.03	-0.09	0.09	-0.03
% Population in Poverty	-0.25	0.11	-0.07*	-0.31	0.11	-0.09**	-0.31	0.11	-0.09**
% Vacant Housing	0.35	1.10	0.01	0.18	1.10	0.00	0.19	1.11	0.01
% Population Urban	0.05	0.02	0.07**	0.06	0.02	0.07**	0.06	0.02	0.07**
Mission Complexity				-0.16	0.13	-0.03	-0.16	0.13	-0.03
Formalization				-0.02	0.22	0.00	-0.02	0.22	0.00
Decentralization				1.58	0.53	0.08**	1.54	0.71	0.07*
% Community Officers				-0.49	0.38	-0.03	-0.49	0.38	-0.03
Comm. Pol. Strategies				0.20	0.11	0.05	0.21	0.12	0.05
Total Employees							-0.06	0.74	0.00
Adjusted R^2	0.036			0.040			0.040		
F	12.49***			8.60***			7.94***		
F for change in R^2				3.08**			0.01		

*p < 0.05 **p < 0.01 *** p < 0.001

cleared explain about 7.5% of the variance in clearances. The models that examined the clearance rate for all assaults explained a little more than 5%, while the models that looked at simple assaults explains approximately 4% of the variance. The standardized beta coefficient for both size variables in the felony assault analysis is negative, suggesting that as the size of the agency increases, the percentage of felony assaults cleared will decreases. This is contradictory to the study's hypothesis. Size is not a significant factor in predicting the percentage of simple assaults cleared.

For each of the six analyses, the diagnostic statistics and plots support the belief that the regression violates none of the critical assumptions. The histogram

plots are essentially normal and the P-P plots closely follow the 45-degree diagonal, confirming the assumption of normality of the error term. Each of the plots of the residual and the predicted values shows good scatter. For each of the analysis, the zero-order correlation and collinearity statistics confirm that multicollinearity is not a significant problem.

Burglary

The fifth category of crime analyzed is burglary. Burglary, which is the unlawful entry of a structure to commit a felony or a theft, is the first property crime this study analyzes. The UCR Program classifies offenses locally known as burglary (any degree), unlawful entry with intent to commit a larceny or felony, breaking and entering with intent to commit a larceny, housebreaking, safecracking, and all attempts at these offenses as burglary (United States Department of Justice, 2004).

In the first phase of the analysis, multiple regression creates a significant model (Model 1) with the community and workload variables. Three variables are significant: percentage of the population that is black, percentage of the population with a bachelors degree and the percentage of the population that is urban. Model 1 is significant at the 0.001 level but explains less than 3% of the variance in percentage of burglaries cleared. Both the percentage of the population that is black and the percent of the population that is urban have a positive standardized beta coefficient. This means that as either percentage of the population that is black and the percent of the population that is urban increases, the percentage of burglaries cleared should also increase. The percentage of the population with a bachelors degree has a negative beta

coefficient. This implies an inverse relationship to the percentage of burglaries cleared

The second phase of the regression analysis involves entering the agency variables. This model (model 2) is statistically significant at the 0.001 level, and the change associated with the addition of the agency variables is significant. The adjusted R-square increases from 0.023 to 0.028. Only one agency variable contributes significantly to Model 2: the formalization variable. The population that is black, percentage of the population with a bachelors degree and the percentage of the population that is urban also remain significant.

The final phase of the analysis involves adding the size variable sworn officers to create model 3. Once again, the model is significant at the 0.001 level. However, the addition of the sworn officers does not improve the models ability to predict burglary clearance rates. The adjusted R-square does not change (0.028) and the F change (0.12) is not significant. Table 17 summarizes the results of the analysis.

A second analysis, using the total number of employees, yields similar models. When the study adds the size variable total employees, the change associate with the addition of the size variable is not significant and does not increase the adjusted R-square. The final overall model (Model 3) is significant at the 0.001 level. The control variables the population that is black, percentage of the population with a bachelors degree and the percentage of the population that is urban are all significant and have the same coefficients as the variables did in the sworn officer analysis. Although the coefficients for both size variables

TABLE 17: Regression Summary for Burglary and Sworn Officers

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Burglaries Cleared (n = 2176)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	2.43	0.20		2.00	0.24		2.00	0.24	
Caseload	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01
% Population Black	0.05	0.02	0.06**	0.04	0.02	0.05*	0.04	0.02	0.06*
% Population Under 25	-0.01	0.00	-0.04	-0.01	0.00	-0.04	-0.01	0.00	-0.04
% Population Bac. Deg.	-0.01	0.00	-0.06*	-0.01	0.00	-0.07**	-0.01	0.00	-0.07**
% Population in Poverty	0.00	0.00	-0.03	0.00	0.00	-0.01	0.00	0.00	-0.01
% Vacant Housing	0.00	0.04	0.00	0.00	0.04	0.00	0.00	0.04	0.00
% Population Urban	0.00	0.00	0.15***	0.00	0.00	0.13***	0.00	0.00	0.13***
Mission Complexity				0.01	0.00	0.05	0.01	0.01	0.05*
Formalization				0.02	0.01	0.06*	0.02	0.01	0.06**
Decentralization				-0.01	0.02	-0.01	-0.01	0.03	-0.02
% Community Officers				0.01	0.01	0.02	0.01	0.01	0.02
Comm. Pol. Strategies				0.00	0.00	0.01	0.00	0.00	0.01
Sworn Officers							-0.01	0.03	-0.01
Adjusted R^2	0.023			0.028			0.028		
F	8.23***			6.29***			5.81***		
F for change in R^2				3.51**			0.12		

*p < 0.05 **p < 0.01 *** p < 0.001

are positive, they are so small that drawing any conclusions would not be prudent. Table 18 summarizes the results of the second analysis.

For both analyses, the diagnostic statistics and plots support the belief that the analysis did not violate any critical assumptions. The histogram plots are essentially normal and the P-P plots closely follow the 45-degree diagonal, confirming the assumption of normality of the error term. Each of the plots of the residual and the predicted values shows good scatter. For each of the analysis, the zero-order correlation and collinearity statistics confirm that multicollinearity is not a significant problem.

TABLE 18: Regression Summary for Burglary and Total Employees

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Burglaries Cleared (n = 2176)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	2.43	0.20		2.00	0.24		2.01	0.24	
Caseload	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00
% Population Black	0.05	0.02	0.06**	0.04	0.02	0.05*	0.04	0.02	0.06*
% Population Under 25	-0.01	0.00	-0.04	-0.01	0.00	-0.04	-0.01	0.00	-0.04
% Population Bac. Deg.	-0.01	0.00	-0.06*	-0.01	0.00	-0.07**	-0.01	0.00	-0.07**
% Population in Poverty	0.00	0.00	-0.03	0.00	0.00	-0.01	0.00	0.00	-0.01
% Vacant Housing	0.00	0.04	0.00	0.00	0.04	0.00	0.00	0.04	0.00
% Population Urban	0.00	0.00	0.15***	0.00	0.00	0.13***	0.00	0.00	0.13***
Mission Complexity				0.01	0.00	0.05	0.01	0.01	0.05*
Formalization				0.02	0.01	0.06*	0.02	0.01	0.06*
Decentralization				-0.01	0.02	-0.01	-0.02	0.03	-0.03
% Community Officers				0.01	0.01	0.02	0.01	0.01	0.02
Comm. Pol. Strategies				0.00	0.00	0.01	0.00	0.00	0.01
Total Employees							-0.02	0.03	-0.03
Adjusted R^2	0.023			0.028			0.028		
F	8.23***			6.29***			5.83***		
F for change in R^2				3.51**			0.40		

*p < 0.05 **p < 0.01 *** p < 0.001

Larceny

The sixth category of crime analyzed is larceny. Larceny is the unlawful taking or carrying away of property from the possession or constructive possession of another. Larceny and theft mean the same thing in the UCR Program. All thefts and attempted thefts are included in this category with the exception of motor vehicle theft (United States Department of Justice, 2004).

The first phase of the hierarchical regressions uses multiple regression to create a model using community and workload variables that is significant in predicting the percentage of larcenies cleared. That model (Model 1) is significant, but it explains only 1% of the variance found in the percentage of

larcenies cleared. Three of the control variables are significant. They are the percentage of the population under 25, housing vacancy rate and percentage of the population that s urban. For both the percentage of the population under 25 and housing vacancy rate, the coefficient is negative, indicating that as the percentage of the population under 25 increases or the housing vacancy rate increases, the percentage of the larcenies cleared decreases. Percentage of the population that is urban has a positive coefficient, predicting an increase in larceny clearances as the percent of population that is urban increases.

Adding the agency variables significantly improves the models ability to predict the percentage of larcenies cleared. The adjusted R-square improves to 0.034 and the F change is significant t the 0.001 level. In this model (model 2), the agency variables decentralization, and mission complexity are significant. Creating the final model with the addition of the size variable (sworn officers) does not significantly improve upon model 2's ability to predict the percentage of larcenies cleared. While overall model 3 is significant, the F change is not. The adjusted R-square for model 3 decreases slightly to 0.033. Table 19 summarizes the results of this analysis.

Rerunning the analysis using the size variable total number of employees creates a model similar to the model created using sworn officers. The same variables are significant and although some of the coefficients have slightly different standardized values, the signs remain the same. For both size variables, their addition to the model does not improve model and size does not appear to play a role in the percentage of larcenies cleared. Table 20

TABLE 19: Regression Summary for Larceny and Sworn Officers

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Larcenies Cleared (n = 2103)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	4.24	0.16		4.50	0.19		4.49	0.19	
Caseload	0.00	0.00	-0.02	0.00	0.00	-0.02	0.00	0.00	-0.02
% Population Black	-0.01	0.01	-0.01	0.01	0.01	0.01	0.01	0.02	0.01
% Population Under 25	-0.01	0.00	-0.09***	-0.01	0.00	-0.07**	-0.01	0.00	-0.07*
% Population Bac. Deg.	0.00	0.00	-0.04	0.00	0.00	-0.03	0.00	0.00	-0.03
% Population in Poverty	0.00	0.00	0.03	0.00	0.00	-0.01	0.00	0.00	-0.01
% Vacant Housing	-0.07	0.03	-0.06*	-0.07	0.03	-0.07*	-0.08	0.03	-0.07*
% Population Urban	0.00	0.00	0.08**	0.00	0.00	0.10***	0.00	0.00	0.09***
Mission Complexity				-0.01	0.00	-0.08***	-0.01	0.00	-0.08***
Formalization				-0.01	0.01	-0.03	-0.01	0.01	-0.03
Decentralization				0.08	0.02	0.13***	0.08	0.02	0.13***
% Community Officers				0.00	0.01	-0.01	0.00	0.01	-0.01
Comm. Pol. Strategies				0.00	0.00	0.04	0.00	0.00	0.03
Sworn Officers							0.01	0.02	0.02
Adjusted R^2	0.010			0.034			0.033		
F	4.08***			7.12***			6.58***		
F for change in R^2				11.23***			0.13		

*p < 0.05 **p < 0.01 *** p < 0.001

summarizes the results of the second regression analysis.

All of the control variables that are significant have a negative coefficient indicative of an inverse relationship. Additionally, for both analyses, the diagnostic statistics and plots indicate that the analyses do not violate any critical assumptions.

Vehicle Thefts

The seventh and final category of crime analyzed is vehicle thefts. Vehicle theft is the theft or attempted theft of a motor vehicle which includes automobiles, trucks, buses, motorcycles, motor scooters, all-terrain vehicles, and snowmobiles

TABLE 20: Regression Summary for Larceny and Total Employees

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Larcenies Cleared (n = 2103)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	4.24	0.16		4.50	0.19		4.50	0.19	
Caseload	0.00	0.00	-0.02	0.00	0.00	-0.02	0.00	0.00	-0.02
% Population Black	-0.01	0.01	-0.01	0.01	0.01	0.01	0.01	0.02	0.02
% Population Under 25	-0.01	0.00	-0.09***	-0.01	0.00	-0.07*	-0.01	0.00	-0.07*
% Population Bac. Deg.	0.00	0.00	-0.04	0.00	0.00	-0.03	0.00	0.00	-0.03
% Population in Poverty	0.00	0.00	0.03	0.00	0.00	-0.01	0.00	0.00	-0.01
% Vacant Housing	-0.07	0.03	-0.06*	-0.07	0.03	-0.07*	-0.07	0.03	-0.07*
% Population Urban	0.00	0.00	0.08**	0.00	0.00	0.10***	0.00	0.00	0.10***
Mission Complexity				-0.01	0.00	-0.08***	-0.01	0.00	-0.08***
Formalization				-0.01	0.01	-0.03	-0.01	0.01	-0.03
Decentralization				0.08	0.02	0.13***	0.08	0.02	0.12***
% Community Officers				0.00	0.01	-0.01	0.00	0.01	-0.01
Comm. Pol. Strategies				0.00	0.00	0.04	0.00	0.00	0.04
Total Employees							0.00	0.02	-0.01
Adjusted R^2	0.010			0.034			0.033		
F	4.08***			7.12***			6.57***		
F for change in R^2				11.23***			0.026		

*p < 0.05 **p < 0.01 *** p < 0.001

(United States Department of Justice, 2004). This category does not include farm equipment, bulldozers, airplanes, construction equipment, or watercraft. Nor is the taking a vehicle for temporary use when prior authority has been granted or the unauthorized use by those having lawful access to the vehicle considered motor vehicle theft. Motor vehicle theft does include all cases where automobiles are taken, even taken for joyriding or later abandoned (United States Department of Justice, 2004).

The first phase of the hierarchical regression involves adding the community and caseload variables to create a statistically significant model at the 0.001 level. The model (Model 1) has an adjusted R-square of 0.022. All of the

community variables are significant except percentage of the population that is black and percentage of the population in poverty. The caseload variable is not significant. All of the significant community variables except percentage of the population that is in poverty have positive standard beta coefficients, indicating that as these values increase, the percentage of vehicle thefts cleared will also increase. The other community variable (percentage of the population in poverty) has a positive beta coefficient.

Adding the agency variables to the model to create Model 2 does improve the model's ability to predict. The community, caseload, and agency control variable model (model 2) explains 3% of the variation in percentage of vehicle thefts cleared, up from 2.2% for Model 1. All of the community variables that are significant in model 1 remain significant in model 2. Additionally, the agency variables decentralization and percentage of community officers are significant. The F change for Model 2 is statistically significant at the 0.001 level. The final step of the analysis involves adding the size variable total sworn officers. The model created with size (Model 3) is significant at the 0.001 level and increases the models ability to predict slightly, to 3.3%. The size variable is significant at the 0.01 level. The agency variable mission complexity is also reaches significance (at the 0.05 level) in model 3. The impact of the other control variables is unchanged. Table 21 summarizes the results of this first vehicle theft analysis.

The coefficient of the size variable is negative, indicating that as agency size increases the percentage of vehicle thefts cleared decreases. Rerunning the analysis using the size variable total number of employees yields a model similar

TABLE 21: Regression Summary for Vehicle Thefts and Sworn Officers

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Vehicle Thefts Cleared (n = 2098)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	1.23	0.27		1.28	0.33		1.33	0.33	
Caseload	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
% Population Black	0.00	0.02	0.00	-0.01	0.03	-0.01	0.02	0.03	0.02
% Population Under 25	0.02	0.01	0.09***	0.02	0.01	0.08**	0.02	0.01	0.08**
% Population Bac. Deg.	-0.01	0.00	-0.06*	-0.01	0.00	-0.07*	-0.01	0.00	-0.06*
% Population in Poverty	-0.01	0.01	-0.06	-0.01	0.01	-0.04	-0.01	0.01	-0.04
% Vacant Housing	0.31	0.06	0.16***	0.31	0.06	0.16***	0.32	0.06	0.17***
% Population Urban	0.00	0.00	0.12***	0.00	0.00	0.11***	0.01	0.00	0.13***
Mission Complexity				0.01	0.01	0.04	0.02	0.01	0.05*
Formalization				-0.01	0.01	-0.02	-0.01	0.01	-0.02
Decentralization				-0.06	0.03	-0.05*	-0.11	0.03	-0.11***
% Community Officers				-0.05	0.02	-0.06**	-0.05	0.02	-0.06**
Comm. Pol. Strategies				0.00	0.01	0.02	0.01	0.01	0.05
Sworn Officers							-0.10	0.04	-0.11**
Adjusted R^2	0.022			0.030			0.033		
F	7.81***			6.37***			6.46***		
F for change in R^2				4.27***			7.33**		

*p < 0.05 **p < 0.01 *** p < 0.001

to the final model for sworn officer. The total employee model has an adjusted R-square of 0.032, as compared to 0.033 for sworn officers. The coefficients of all the control variables remain the same for the total employee's model. The size variable total employees is significant in the final model (Model 3), but at the 0.05 level. The change associated with the addition of the size variable is significant at the 0.001 level. Once again, all the community variables in Model 3 except percentage of the population in poverty are significant, as well as mission complexity, decentralization, and use of community policing strategies. The mission complexity achieves significance in model 3. Table 22 summarizes the results of this analysis.

TABLE 22: Regression Summary for Vehicle Thefts and Total Employees

Summary of Hierarchical Regression Analysis for Variables Predicting Adjusted Percentage of Vehicle Thefts Cleared (n = 2098)

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
(Constant)	1.23	0.27		1.28	0.33		1.32	0.33	
Caseload	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
% Population Black	0.00	0.02	0.00	-0.01	0.03	-0.01	0.01	0.03	0.01
% Population Under 25	0.02	0.01	0.09***	0.02	0.01	0.08**	0.02	0.01	0.08**
% Population Bac. Deg.	-0.01	0.00	-0.06*	-0.01	0.00	-0.07*	-0.01	0.00	-0.06*
% Population in Poverty	-0.01	0.01	-0.06	-0.01	0.01	-0.04	-0.01	0.01	-0.04
% Vacant Housing	0.31	0.06	0.16***	0.31	0.06	0.16***	0.33	0.06	0.17***
% Population Urban	0.00	0.00	0.12***	0.00	0.00	0.11***	0.00	0.00	0.12***
Mission Complexity				0.01	0.01	0.04	0.02	0.01	0.06*
Formalization				-0.01	0.01	-0.02	-0.01	0.01	-0.02
Decentralization				-0.06	0.03	-0.05*	-0.11	0.04	-0.10**
% Community Officers				-0.05	0.02	-0.06**	-0.05	0.02	-0.06**
Comm. Pol. Strategies				0.00	0.01	0.02	0.01	0.01	0.04
Total Employees							-0.08	0.04	-0.09*
Adjusted R^2	0.022			0.030			0.032		
F	7.81***			6.37***			6.26***		
F for change in R^2				4.27***			4.83*		

*p < 0.05 **p < 0.01 *** p < 0.001

All of the significant community control variables except percentage of the population with a bachelors degree and mission complexity have a positive coefficient, indicating that as any of their values increase, the percentage of vehicle thefts cleared will also increase. The three other significant control variables (percentage of the population with a bachelors degree, decentralization, and percentage of community police officers) have a negative coefficient, predicting an inverse relationship between these variables as the clearance of vehicle thefts. Additionally, for both analyses, the diagnostic statistics and plots support the contention that the analysis did not violate any critical assumptions.

Summary

The goal of this study is to determine if police agency size has an impact on their ability to clear reported crimes. The study hypothesizes that, with other influencing factors controlled for, larger agencies will clear a greater percentage of the crimes reported. To accomplish this, the study develops a data set that consists of UCR, LEMAS, and Census Bureau data for 2,271 local police agencies. With this data set, this study will use SPSS Statistical Analysis software to conduct a linear regression to assess the influence of police agency size on crime clearances after controlling for the affect of the significant individual, community, and organization variables.

The first step in this analysis is to check and review the descriptives for each of the potential variables the study proposes to use. After ensuring the data was complete and accurate, the study conducts an analysis of the variables checking for correlation and collinearity. That analysis confirmed that several variables may have possible problems, necessitating the evaluation and refinement of several of the potential control variables. Ultimately, the study selects one workload variable, six community variables and five agency variables for inclusion as control variables in the regression analysis.

The study then uses hierarchical regression to create three models for each of the seven crime categories. One of those crimes, assault, is further broken down into felony and simple assault categories. The first model includes the community and workload control variables. Adding the agency related control variables is the second phase of the analysis. The final phase involves introduces the size variable. The study conducts nine separate analyses for both

the total number of sworn officers and total number of employees. This chapter summarizes and displays in tabular for, the results of these 18 analyses. Chapter 5 will examine the analysis and its findings, determine what conclusions can be drawn, and discuss their implications. Chapter 5 will also consider area for future research.

CHAPTER 5: SUMMARY AND CONCLUSION

The final chapter of this dissertation discusses the conclusions regarding the research and findings previously presented. The chapter starts with a summary of the study and then outlines the findings of the research. The chapter then goes into a detailed discussion of the findings and the conclusions that can be drawn from those findings. The chapter concludes with a discussion of the implications of the study's findings and outlines some possible areas for future research.

Summary of the Study

The purpose of this study is to examine the role that police agency size plays in the agency's ability to clear reported crimes. The question of police agency size has been at issue for more than 50 years. In 1967, President Johnson's Commission on Law Enforcement and the Administration of Justice questioned the ability of small police departments to provide effective policing services (The Challenge of Crime in a Free Society, 1967). Several years later, the National Advisory Commission on Criminal Justice Standards and Goals recommended the elimination of all police departments with less than 10 officers (Report on Police, 1973). However, concerns over the effectiveness of small police agencies was not universal, and a growing public choice movement believed that smaller agencies were actually able to provide higher levels of service than larger agencies (Ostrom, Parks, & Whitaker, 1973). The challenge

for researchers and practitioners alike has been how best to define and measure police work.

The police have historically reported their activities, but the majority of those efforts were simply activity totals (i.e., arrests made, reports filed, etc.). One of the challenges in measuring police work is that the job is diverse and often varies from agency to agency (Maguire & Uchida, 2000; Wells & Falcone, 2005). This study focuses on one of the core elements of policing: conducting criminal investigations (American Bar Association, 1980). The study uses crime clearance rates as a measure of police effectiveness. While they are certainly not the only measure of police effectiveness, scholars and researchers have accepted and frequently use crime clearance rates when evaluating the efforts of the police (Paré & Ouimet, 2004). Recognizing that the type of crime plays a role in clearance rates, the study utilizes seven index crimes from the FBI's Uniform Crime Reports (UCR). In addition, the literature has demonstrated that there are a wide variety of factors that can influence crime clearance rates. Accordingly, the study developed and included 12 control variables that allow for the inclusion of the effects of agency workloads, community demographics, and agency characteristics in the analysis.

The study's independent variable is agency size and each analysis actually conducts two separate analyses, one using total number of sworn officers and the second using total number of employees. Using multiple regression, the study creates three models for each crime type. The first model loads the workload and community variables. The second model adds the agency characteristics. The final version of the model adds the size variable. The resulting analysis reveals

the impact of agency size, while controlling for the effect of the community and agency variables, on the clearance rates of each of the UCR index crimes.

To develop a data set, the study combines the Law Enforcement Management and Administrative Statistics (LEMAS): 2003 Sample Survey of Law Enforcement Agencies with the FBI's UCR data and US Census Bureau data to create a file of more than 2,000 municipal and county law enforcement agencies. To ensure the assumptions needed for regression are not violated, the study transforms several of the variables. With this data set, the study analyzes the impact of agency size (as measured by both sworn officers and total employees) on the clearance rates for seven index crimes. Additionally, the study conducts the same analysis on two sub categories of total assault, after breaking the assaults down into simple and felony assaults.

Findings

For each crime category, the study conducts a thee phase analysis, assessing the impact of agency size on clearance rates. The first step of each analysis involved adding the community and workload predictors to create Model 1. The community variables include the log of the percentage of population that is black, percentage of population under 25 years of age, percentage of population (over 25) with bachelors degree, percentage of the population below poverty line, log of the housing vacancy rate, and the percentage of population described as urban. The workload variable is caseload, defined as the total crimes per total sworn officers. The second step involves adding the community policing variables (mission complexity scale, formalization of rules and policies, decentralization, percentage of community police officers, and use of community

policing strategies) to create model 2. In the final phase of the analysis, the study adds the independent variable (total number of sworn officers) to create model 3. The same process for followed for each of the nine crime categories. The study analyzes the seven UCR Part I crimes, and breaks down the assault category into felony and simple assaults. Table 23 is a summary of the results of the analysis of the seven crime categories, with assaults broken out into felony and simple assault.

The table includes the F score for the final model created, noting the level of significance, as well as the change in F associated with the final step (adding the total number of sworn officers and the level of significance associated with the change). The table also includes the overall adjusted R-square, the standardized beta coefficient and the R-square change associated with the addition of the size variable. For every crime category, the final model is significant, indicating the model improves upon the ability to predict the percentage of crimes cleared over simply using the average value. However, the variance explained varies a great deal between crime categories. The adjusted R-square values range from 0.01 for rape to 0.08 for felony assaults.

The study then reran each analysis using the total number of employees to measure the agency size. Total employees is the sum of the number of sworn officers and the number of non-sworn staff. The results are nearly identical to the sworn officer models, with a couple of exceptions. The most notable of these differences is in the standardized beta coefficient difference between the sworn officer and total employee size variables in the property crime analyses. In the analysis of the percentage of vehicle thefts, both size variables are significant, but

TABLE 23: Summary of Results for Crime Type and Sworn Officers

Summary of Regression Results for Agency Size Predicting Adjusted Percentage of Crimes Cleared, including the changes associated with the addition of the size variable.

Crime	F for Overall Model	F Change Associated with Addition of Size Variable	Adjusted R-Square	Standardized coefficient (Beta) for Size Variable	R-Square Change
Murder	2.85**	0.78	0.02	0.043	0.001
Rape	1.74*	1.30	0.01	-0.048	0.001
Robbery	9.57***	6.94**	0.06	-0.106**	0.004
Total Assaults	10.36***	1.76	0.05	-0.055	0.001
Felony Assault	14.06***	11.35***	0.08	-0.138***	0.005
Simple Assault	7.96***	0.24	0.04	-0.020	0.000
Burglary	5.81***	0.12	0.03	-0.014	0.000
Larceny	6.58***	0.13	0.03	0.015	0.000
Vehicle Theft	6.46***	7.33**	0.03	-0.113**	0.003

*p < .05. **p < .01. *** p < 0.001

Predictors: (Constant), Percentage of Pop described as Urban, Percentage of Population Living below Poverty Line, Caseload (total crimes per total sworn officers), Log of the Percentage of Pop Black, Percentage of Population Under 25 YOA, Percentage of Pop (over 25) with Bachelors Degree, Log of the Housing Vacancy, Log of Percentage of Community Police Officers, Mission Complexity Scale, Formalization of rules and policies, Log of Decentralization (Police Facilities per 10000), Use of Community Policing Strategies, Log of Total Sworn

at different levels. The coefficient is also slightly larger for sworn officers versus total employees. The size variables also differ with the other property crime and simple assault analyses, although the variables are not significant, limiting the ability to draw conclusions. Table 24 summarizes the results of the total employee's analysis.

Examining each crime category individually reveals some significant variations, justifying the separate analysis for each crime. The first regression analysis conducted examines the impact of agency size on the clearance rate for murder. The models developed using sworn officers and total employees are similar in their significance and variable coefficients. The initial model created with community and workload variables is significant, but the only variable that is

TABLE 24: Summary of Results for Crime Type and Total Employees

Summary of Regression Results for Agency Size Predicting Adjusted Percentage of Crimes Cleared, including the changes associated with the addition of the size variable.

Crime	F for Overall Model	F Change Associated with Addition of Size Variable	Adjusted R-square	Standardized coefficient (Beta) for Size Variable	R-square Change
Murder	2.53**	0.59	0.02	0.038	0.001
Rape	1.73*	1.20	0.01	-0.047	0.001
Robbery	9.64***	7.81**	0.06	-0.115**	0.004
Total Assaults	10.29***	0.94	0.52	-0.041	0.000
Felony Assault	14.02***	10.90***	0.08	-0.138***	0.005
Simple Assault	7.94***	0.01	0.04	-0.004	0.000
Burglary	5.83***	0.40	0.03	-0.027	0.000
Larceny	6.57***	0.03	0.03	-0.007	0.000
Vehicle Theft	6.26***	4.83*	0.03	-0.093*	0.002

*p < .05. **p < .01. *** p < 0.001

Predictors: (Constant), Percentage of Pop described as Urban, Percentage of Population Living below Poverty Line, Caseload (total crimes per total sworn officers), Log of the Percentage of Pop Black, Percentage of Population Under 25 YOA, Percentage of Pop (over 25) with Bachelors Degree, Log of the Housing Vacancy, Log of Percent of Community Police Officers, Mission Complexity Scale, Formalization of rules and policies, Log of Decentralization (Police Facilities per 10000), Use of Community Policing Strategies, Log of the Total Employees

significant is percentage of the population under 25. The standardized beta coefficient is negative, indicating that as the percentage of people under 25 increases, the predicted percentage of murders cleared will decrease. None of the other community or caseload variables affects the clearance rate. When the agency control variables are added, the model improves slightly (but significantly), with the adjusted R-square increasing from 0.012 to 0.019. The only significant agency variable is formalization, which has a negative beta coefficient, indicating an inverse relationship between the amount of structure and rules in a police agency and the percentage of murders cleared. Adding the size variable does not significantly improve the models ability to predict, though the overall model remains significant at the 0.01 level. The coefficient for both sworn

officers and total employees is positive, but neither is significant. The adjusted R-squared for the sworn officers model is unchanged and for total employees, the adjusted R-squared actually decreases to 0.018.

The study then examines the impact of agency size on the percentage of rapes cleared. Like murder, the effect of agency size on the percentage of rapes cleared is not significant, and the two size variables create similar models. For both initial models, the only significant variables are caseload and percentage of the population that is black. The addition of the agency control variables and size variable does not improve the model, and the adjusted R-square actually decreases to 0.005 (from 0.007). Both size variables have a negative standardized beta coefficient, but they are not significant. Overall, neither rape model is very effective and both explain less than 1% of the variance in the percentage of rapes cleared.

The third crime the study examines is robbery. The role of size in the clearance of robberies is significant for both number of sworn officers and total employees. All of the final models are significant at the 0.001 level and models created with both size variables have an adjusted R-square of 0.06. The addition of the size variable is significant and improves the models ability to predict over the model incorporating the control variables only. The standardized coefficient of both size variables is negative, indicating an inverse relationship between agency size and percentage of robberies cleared. Several of the control variables also contribute significantly to the model. When adding the community and workload variables to the regression, the variables caseload, the percentage of the population that is black, and the housing vacancy rate are significant. In the

second phase, in addition to the effect of workload and community variables, the decentralization variable is also significant. In the final model, in addition to size variable, only caseload, the percentage of the population that is black, and housing vacancy rate are significant. The decentralization rate (the number of police facilities per 10,000 citizens) is not significant in the final models and the standardized beta coefficient is reduced from 0.07 to 0.01 in the sworn officer model and 0.02 in the total employees model, suggesting size has a mediating effect. Based on the standardized beta coefficients, the role of the other significant control variables does not change when adding size to the model. When conducting the analysis using the total number of employees, the results are similar, with the same variables having significance.

The final violent crime category the study analyzes is assault. Because of the more detailed manner in which the FBI collects UCR data on assaults, the study analyzes these crimes by examining the total number of assaults, as well as breaking down assault into simple and felony assault categories. The study first examines the role in agency size for all assaults. The control variable model, including community, caseload, and agency variables is significant and explains more than 5% of the variance in the percentage of total assaults cleared. Adding the size variable creates a significant model, however the role of the size variables is not significant. For size variables, the final sworn officer model has an adjusted R-square of 0.053, while the final total employee model has an adjusted R-square of 0.052. In addition to caseload, which has a significant impact on assault clearances, several of community variables are also significant, including the percentage of the population that is black, the percentage of the

population that is in poverty, and the percentage of the population considered urban. Adding the agency variables improves the model and both mission complexity and decentralization are significant. After adding the size variables, the significance of all of the agency control variables changes. In the final model, only the percentage of community police officers is significant. Mission complexity and decentralization are no longer significant.

Because the data are available, the study is able to conduct separate analyses for simple and felony (or aggravated) assault. The results of these are very different. For felony assaults, the role of agency size is significant. Both sworn officers and total employees improve upon the ability of the control models to predict the percentage of felony assaults cleared. In both cases, the relationship between size and clearance rate is an inverse relationship, indicating that as agency size increases, the percentage of felony assaults cleared decreases. Both size models explain approximately 7.5% of the variance in the percentage of felony assaults cleared. The significant control variables include caseload, the percentage of the population that is black, and the percentage that is in poverty and percentage that is urban. Once again, decentralization, which had been significant in the model 2 (the model created with all of the control variables prior to the addition of the size variable), is not significant in the final model.

The results of the simple assault analysis are not as robust. Both size models explain approximately 4% of variance in the percentage of simple assaults cleared and the addition of the size variable is not significant. There is no change in the adjusted R-square. For simple assaults, several community

variables are significant, including the percentage of the population that is black, the percentage that is in poverty, and percentage of the population that is urban. Caseload is also significant, as is the agency variable decentralization. All of the significant control variables except percentage for the population that is urban and decentralization have a negative beta coefficient. Unlike the robbery and felony assault models, the decentralization variable remains significant in the final model. Overall, while the final model is significant, the addition of the size variables do not improve the model's ability to predict the percentage of simple assaults cleared.

The final three crime categories this study examines are the property crimes of burglary, larceny, and vehicle theft. Once again, the findings vary by the type of crime. The first property crime the study analyzes is burglary. For burglary, regression analysis yields statistically significant results for both size variables. However, while the final model is significant, the final model does not explain much of the variance in burglary clearance rates. Additionally, the role of the control variables is not consistent with their role in other crime categories. For example, caseload, which is significant in all of the violent crime categories (except murder) is not significant for property crime categories. The percentage of the population that is black is significant. The study hypothesizes a significant and inverse relationship. For burglary, the positive beta coefficient suggests burglary clearances will *increase* as the percentage of the population that is black increases. Burglary and robbery are the only crime categories where this variable is significant and has a positive coefficient. In addition, the percentage of the population with a bachelors degree and percentage of the population that is urban

are also significant. When adding the agency variables, only the formalization variable is significant. Neither size variable significantly improves upon the control variable model's ability to predict the percentage of burglaries cleared. In the final model, percentage of the population that is black, percentage of the population with a bachelors degree, percentage of the population considered urban, mission complexity and formalization are all significant. Overall, the models explain little of the variance found in the percentage of burglaries cleared, with both size variables producing a model with an adjusted R-squared of only 0.028.

The second property crime the study examines is larceny. Like burglary, regression analysis yields results that are significant, but with a relatively small adjusted R-square. The final models for both size variables are significant (at the 0.001 level). However, the addition of the size variable is not significant for the either size model. In the final models, the community variables percentage of the population under 25, housing vacancy rate, and percentage of the population that is urban are significant. Adding the agency variables improves the model, with the adjusted R-square rising to 0.034 (from 0.010). Mission complexity and decentralization are both significant at the 0.001 level. Adding the size variable actually reduce the adjusted R-square to 0.033 for both size models. In both models, all of the significant variables except percentage of the population that is urban and decentralization have a negative standardized coefficient.

The study's final crime category is vehicle thefts. Similar to the other property crime categories, regression creates a significant model for both size variables. However, unlike the other property crime categories, the size variables

are significant. Overall, despite the significant addition of the size variables, both models explain the same amount of the variation in vehicle theft clearances as the final larceny models (an adjusted R-square of 0.033). In both vehicle theft models, the community control variables percentage of population under 25, percentage with bachelors degree, housing vacancy rate and the percentage of pop described as urban are all significant, as well as the agency variables mission complexity, decentralization and percentage of community police officer. The addition of the agency variables does significantly improve the community control variable model. The addition of either the sworn officer or total employee variable does improve the model's ability to predict vehicle theft clearance rate and that improvement is significant. Both size variables have a negative standardized beta coefficient, suggesting the as agency size increases, vehicle theft clearance rates will decrease. This is contrary to the study's hypothesis.

Conclusions

The hypothesis of the study is that larger agencies should be able to clear a greater percentage of the crimes reported to them, holding all other factors constant, than smaller agencies. The study theorizes that larger agencies will be more efficient and effective in the allocation, distribution and use of resources, primarily manpower. The study uses clearance rate as a measure of police agency investigative effectiveness. By examining a variety of local and county police agencies, the study attempts to determine if size positively (or negatively) influences an agency's ability to clear reported crimes in seven UCR crime categories.

The results of the analyses are mixed. In several crime categories, size

has very little or no impact, but in other categories, the impact of size is significant. For both murder and rape, the effect of agency size on the clearance rate is effectively nonexistent. The standardized beta coefficient for sworn officers for murder clearance rates is 0.04 and the coefficient is -0.04 for rape. For total employees, the values are 0.04 and -0.05. None of the variables are significant, indicating that size does not play a role in murder or rape clearance rates. While these results may not be consistent with the study's hypothesis, the serious nature of these crimes may explain the lack of significance. All communities would expect their police department, regardless of their size, to commit all possible resources and maximum effort to the investigation of a serious violent crime such as murder or rape. Because of the high profile nature of these crimes, all police agencies are likely investigate every murder or rape thoroughly, using all possible resources.

In addition to lack of significance of agency size, most of the community and agency control variables also exhibit little effect on the clearance rates for either murder or rape. For murder, the only community or workload variable that contributes significantly is percentage of the population under 25. There are several possible reasons why this variable is significant. One possibility is the theorized relationship between citizen age and support of the police. Peek, Lowe and Alston (1981) found younger citizens are less likely to trust or support the police. As a result, police serving communities with a greater percentage of citizens under 25 may receive less support, resulting in a lack of information or assistance from the community as they investigate crime. Another possible reason is the nature of a murder may be different in communities with a larger

percentage of young (under 25 years old) residents. In addition to the police response, the nature of a homicide affects the likelihood of policing solving a murder. Research has identified several incident-related characteristics associated with clearance of murders (Addington, 2006). These factors include victim demographics, victim-offender relationship, weapons used, and location of the incident. The police are less likely to solve murders occurring outside, committed with a firearm by person unrelated to the victim. These are characteristics of murders often committed in connection with drug trade. The murders committed in communities with a greater percentage of older residents are more likely to be personal disputes or domestic violence related and may be easier for the police to solve. The UCR data is not offense specific and does not include this information, precluding this study from including these factors.

Of the community policing variables in the murder clearance analysis, only formalization of rules is significant. Based on the beta coefficient, formalization has a slight negative impact. The reason or cause for this relationship is not clear. Maguire (2002) suggest that formalization of the rules is a simple way for an organization to exert control over officers and non sworn staff. Formalization may limit or inhibit creativity and officer initiative, a characteristic associated with community policing. This means, organizations with higher levels of formalization may be less community policing oriented and investigators working for these agencies may resort to more standard “by the book” tactics.

The lack of significant control and size variables does support the prior the belief that murder is a high priority crime for all police agencies, regardless of victim or community characteristics (Klinger, 1997). Several homicide studies

have found that case specific factors are most likely responsible for any variation in clearance rates and not community or agency characteristics (Wellford & Cronin, 1999; Addington, 2006).

This study also found that for rape, another serious violent crime, there was no effect due to agency size. In the analysis of rape clearances, the only significant variables are caseload and percentage of the population that is black. While the lack of significance of the size variable is not consistent with this study's hypothesis, the findings are similar to the murder analysis and the same conclusion may be drawn. Once again, because of the very serious nature of the crime, the police are likely to investigate vigorously many (but not necessarily all) of the reported rapes. Because of the backgrounds or actions of some victims, the criminal justices system may not fully investigate and prosecute all rape cases (LaFree, 1989; Hazelwood & Burgess, 1995). However, in addition to offense specific factors, another factor that could limit criminal investigations in all but the most serious crimes (i.e., murder) is the amount of work an agency must handle. Research has established the impact of caseload in criminal investigations. Both the President Johnson's Crime Commission and the Rand Corporation study identified caseload as a significant factor in the ability of police to investigate crime successfully (The Challenge of Crime in a Free Society, 1967; Chaiken, 1975). The negative standardized coefficient for caseload in the rape analysis is consistent with these previous findings. The caseload variable is also significant in several of the other crime categories this study analyzed, and in each instance, the final models predict that increasing caseload will result in decreasing clearances.

Finally, the role of the percentage of the population that is black is also significant in the rape clearance models, as well as being significant in several other crime categories. The direction of the relationship varies by crime type. For rape, the correlation is positive, indicating that as the percentage of the population that is black increases, the percentage of rapes cleared also increases. This study found similar significant correlations in the burglary category. But the study also found an *inverse* relationship between percentage of the population that is black and clearance rates for robbery, all of the assault categories, and vehicle thefts.

The literature is divided on the role that race plays in criminal investigations. Black (1980) argues that victim characteristics such as race do affect police decision making, and Regoeczi, Kennedy and Silverman (2000) report that homicides with non-white victims were cleared more often, and while others argue that race plays no factor in police investigative efforts (Wellford & Cronin, 1999; Klinger, 1997). This study hypothesizes that race may be factor, with research linking race and satisfaction and support of the police, suggesting that communities with greater percentage of blacks might be less willing to support and offer assistance to the police as they conduct criminal investigations. While much of the research has focused on the role of race and the clearance of homicides, this study would predict the effect would exist for all crime categories. Interestingly, the role of race was either not significant (in murder and larceny) or was positively related to the rape and burglary clearance rates. The lack of significance or the positive relationship in the murder, rape, and burglary categories suggests that race alone may not be a good predictor of support for

the police. A reasonable conclusion may be that everyone (the police and members of the community regardless of race) want the police to solve these serious crimes.

While agency size is not a significant factor in percentage of murders and rapes cleared, the size variables are significant in the clearance rates for the other violent crimes, as well as for vehicle thefts. For robbery, both size variables are significant and the change associated with the addition of the size variable to the regression models is significant. For both size variables (sworn officers and total employees), the F change is significant at the 0.01 level. Contrary to the study's hypothesis, the relationship between size and clearance rate is an inverse one for both variables. The sworn officer size variable has a standardized beta coefficient of -0.11 and for total employees, it is -0.12. The negative coefficients suggest that as agency size increases, robbery clearance rates will decrease.

In the total assault category, the size variables are not significant. However, when total assault is broken down into felony (or aggravated) assaults and simple assaults, the size variables are significant for the felony assault models. For simple assaults, neither sworn officers nor total employees are significant and the final models explain a small amount of the variance in clearance rates. Both the sworn officer and total employees model have an adjusted R-squared of 0.04. However, for felony assaults, the effect of size is significant and the addition of the size variable significantly improves the ability of the model to predict felony assault clearances. The final felony assault models explain 7.5% of the variance in clearance rates, versus 4% for the simple assault models. The change in adjusted R-square associated with the addition of either

size variable for aggravated assault is 0.05. For simple assault, the change in the adjusted R-square is zero.

For felony assaults, like robbery, the relationship between agency size and the percentage of felony assaults cleared is an inverse relationship. The standardized beta coefficient for both sworn officers and total employees is -0.13. The final model predicts that when holding all other control variables constant, as agency size increases, the percentage of aggravated or felony assaults cleared will decrease. This is contrary to the study's hypothesis.

For the three property crimes this study analyzes, the size variables are significant for vehicle theft clearances only. The size variable is not significant for either burglary or larceny. The final burglary models explain a very small amount of the variance in burglary clearance rates, with both sworn officer and total employees having an adjusted R-squared of 0.028. The standardized beta coefficients are both negative, but are not significant and the addition of size to the model does not improve the model's ability to predict burglary clearance rates.

Several control variables are significant in the final burglary model. The significant community control variables include percentage of the population that is black, percentage of the population with a bachelors degree and percentage of the population considered urban. Additionally, the agency variables mission complexity and formalization are significant. Percentage of the population with a bachelors degree has a negative standardized beta coefficient, while all the remaining significant control variables have a positive coefficient. The bachelors degree variable attempts to capture both community economic wellbeing and

citizen support. As the percentage of the population with a bachelors degree increases, the study hypothesizes that both median income and general police support wild increase. The bachelors degree results of this analysis are the anticipated direction.

The results of the analyses of the larceny clearance rates are similar to burglary clearance rates. In the final larceny model, several community and agency variables are significant. They include percentage of the population under 25, housing vacancy rate, percentage of the population that is urban, mission complexity and decentralization. The final model is significant at the 0.001 level, however the addition of the size variables are not significant and do not improve the model's ability to predict the percentage of larcenies cleared.

The only property crime category in which the size variable is significant is vehicle theft. The final models (sworn officer and total employee) have seven of the 12 control variables that are significant, including four community variables and three agency-related variables. The community and agency model is significant at the 0.001 level and has an adjusted R-square 0.030. Adding the size variables to the regression improves the final model's ability to predict the percentage of vehicle thefts cleared. For sworn officers, the change is significant, at the 0.01 level. For total employees, the change is significant at the 0.05 level. Both size variables improve the adjusted R-square slightly to 0.032. When adding the size variable, the mission complexity variable achieves significance. Adding the size variable also improves the significance of the decentralization variable, increasing from the 0.05 level to the 0.01 level. Once again, contrary to the study's hypothesis, both size variables have a standard beta coefficient that is

negative, indicating that as the size of the agency increases, the percentage of vehicle thefts cleared decreases.

In addition to the significant effect of the sworn officer's variable, all of community variables, as well as decentralization and use of community policing strategies, are significant in the vehicle theft models. This is the only crime category where all of the community variables contributed significantly to the final model. The standardized beta coefficient for both the percentage of the population that is black and that is urban is negative, indicating an inverse relationship. The model would predict a decrease in vehicle theft clearances as percentage of the population that is black and/or the percentage that is urban increases. For the other community variables, it is positive. The decentralization variable has a negative coefficient, while the use of community policing strategies has a positive coefficient.

Overall, the study conducts 18 analyses, looking at the effect of two size variables (sworn officers and total employees) on seven crime categories (including the breakdown of assault into felony and simple assault categories). Of the 18 analysis conducted, the size variable is significant in six of those analyses. In each case, there is an inverse relationship between size and percentage of crime cleared, indicating that as size increases the percentage crimes cleared decreases. This is contrary to the study's hypothesis. In only three analyses was the size clearance relationship positive, but for none of those was the size variable role significant. Based upon the study's findings, the size of the police agency does matter. However, the impact is contrary to the relationship the study theorizes. For those categories where size is significant, the model predicts that

smaller agencies will clear a larger percentage of reported crimes.

While there is an inverse relationship between agency size and clearance rates for several crime categories, this was not the case for the majority of the crime categories. The study found agency size did not influence clearance rates for many crimes, most notably for murder and rape. This may be the result of the universal commitment by the police to solve high profile, violent crimes. Additionally, the size variable did not significantly influence the percentage of simple assaults, burglaries, and larcenies cleared. One possible reason for this may be that misdemeanor assaults and property crimes maybe a lower priority for all agencies, regardless of their size. As a lower priority, agencies may be applying less resources and investigative efforts into the solving of these crimes. As a result, agencies may solve only the "easiest" of these minor crimes and end up clearing a small percentage of these crimes, regardless of the agency size. The study suggests that the community, caseload, and agency variables exert greater influence on the clearance of minor crimes than the more serious crimes. Agency size is less influential on the clearance rates of the less serious (property) crimes. The notable exception to this is the significance of the size variable in the clearance of vehicle thefts. The reasons for the inverse relationship between size and vehicle theft clearance is not obvious or self-evident.

In addition to the findings related to agency size, several other findings from the study's analyses are worthy of note. While the effect of the study's control variables is often mixed, several offer potentially useful findings. For example, the role of the percentage of the population that is urban in each of the analysis is somewhat unexpected. In the analyses of five of the eight crime

categories, the percentage of the population that is urban was significant and the standardized beta coefficient is positive. This predicts that as the percentage of the population considered urban increases the percentage of many crimes cleared also increases. This is unexpected, since many advocates of smaller departments believe that increased efficiency is often the results of closer relationships with the community, relationships often typical in small, more rural communities. The results of this study suggest that police agencies serving urban area may have an advantage when it comes to clearing crime. The decentralization variable is also consistently significant and positive, suggesting that efforts to place officers in closer contact with the communities they serve through the use of substations and field offices may be beneficial to investigative efforts.

Implications

Based on this study's findings, when holding a variety of community, workload and agency control variables constant, smaller police agencies are more effective than larger police agencies at clearing several types of crimes, including robbery, felony assault and vehicle theft. The challenge is to implement practically the study's lessons. What is not a realistic alternative is for communities to reduce the size of their police agencies in the hopes of realizing greater investigative effectiveness. Simply reducing staff without a decrease in crime would increase agency workloads. Research (including this study) has repeatedly shown that caseloads and clearance rates are inversely related and simply reducing staff would not increase the percentage of crime cleared.

As previously discussed, one important aspect regarding agency size that

does warrant consideration is how smaller communities can most effectively deliver police services. Smaller communities often must decide between either organizing their own independent agency or contracting services from another (typically larger) agency such as a sheriff or county police department. Each arrangement has advantages and disadvantages. This study offers another potential advantage for communities wanting to form their own agency instead of contracting from a larger agency. Based on this study's findings, communities starting a small, independent agency may provide a more effective level of services, as measured by crime clearances, for at least some crime categories. Certainly, the results of this study indicate there is no disadvantage associated with a smaller police force, as related to their investigative efforts as measured by crime clearance rates.

Readers should take into consideration that this study addresses only agency size and its impact on crime clearance rates. While the findings may support smaller police departments, the findings speak to only one aspect of the police mission. Communities often expect a wide range of services from their police agency. In addition to criminal investigation and patrol functions, many modern agencies are responsible for specialized investigative services (e.g., homicide, arson or cybercrime), community support functions (e.g., animal control, school crossing services, emergency medical services and crime prevention education) and other specialized law enforcement functions (e.g., bomb/explosives disposal, search and rescue, and special weapons and tactics teams). Providing some of these functions may not be practical or even possible for a small police agency. This means that community leaders must be sure they

understand the expectations their citizens and select a police agency capable of meeting all of their demands.

Several of the study's other findings related to the control variables may also be of value to administrators and practitioners. For the most part, the impact of community and demographic variables may be interesting, but there is little a police organization can do to address these types of community issues. However, there is some evidence to suggest that improving the general economic well being of a community benefits the police and can slightly improve their performance as measured by clearance rates. The study's models predict that an increase in the percentage of the population in poverty would result in a decrease the clearance rates of robbery and assault. Similarly, the study also found that increasing housing vacancy rates would also result in decreasing clearance rates for robberies and vehicle thefts. While the effect is small, it does lend support to the idea that there is a relationship between a community's social economic status and crime clearance rates.

This study also includes several control variables that attempt to measure or quantify elements of agency structure, control, and commitment to community policing. The study includes five agency related variables in each analysis: mission complexity, formalization, decentralization (police facilities per 10,000), percentage of community police officers and use of community policing strategies. Mission complexity and formalization look at the nature of the organization and the mechanisms the organization uses to direct and control its members. The latter three variables are relatively direct measures of an agency's commitment to generally accepted community policing strategies and tactics. Of

the three more direct measures of community policing, decentralization was influential in five of the crime categories analyzed. In each of these categories (robbery, total assaults, simple assaults, larceny, and vehicle theft), the relationship was a positive one, predicting that as the number of police facilities (substations, field offices, etc.) increase, the clearance rates would also increase. However, the role of the percentage of community officers in a department and the use of community policing strategies is not significant in most of the crime clearance analyses. The use of community policing strategies was significant in the total assault analysis, although community policing strategies is not significant in the assault subcategories (felony and simple assaults). The percentage of community police officers is significant in only the vehicle theft analysis. The relative lack of significance of the community policing variables is unexpected. Proponents of community policing have suggested that improving police community relations should lead to greater support from the community, which would ultimately result on more effective policing (Horvath, Meesig, & Lee, 2003: 8).

The study's findings are not a condemnation on the use of community policing tactics. The study uses a series of variables created from the available data, based upon the work of previous research examining the role of community policing. However, as previous research has pointed out, quantifying and measuring community policing is an extraordinarily difficult and complex task and many of the current performance measures are inadequate (Fielding & Innes, 2006). Community policing is a philosophy and often requires a change in attitude as agencies pursue their mission. As a result, measuring and quantifying

the commitment to community policing is difficult. Researchers have attempted identify characteristics that can be measured and that are associated with agencies that have successfully implemented community policing. This study uses some of these variables, but they do not represent all of the potential measures of community policing. This study uses five potential measures that look at agency structure and the use of community policing and found that for many of the crime categories, these variables are not significant. The implication is that these tactics may be less effective ways to implement community policing, as opposed to a failure of community policing.

The implication for community policing may be that simply adopting frequently used community policing strategies, such as using citizen surveys or designating officers as community officers, may not be effective. This is not surprising to supporters of community policing. Community policing supporters have long recognized that simply adopting tactics without consideration of their purpose or their true value is not community policing, and will likely not allow the community to reap the benefits of community policing.

Future Research

While the study does answer the questions originally posed, several aspects of the study's findings are ripe for future research. Foremost on that list would be why the size relationship, when it is significant, has an inverse relationship. The study hypothesizes that as agencies increase in size, they would be able to clear a greater percentage of the crimes reported to them. This is possible because larger agencies would able to take advantage of increased staff size through the more efficient scheduling and assigning of officers, including

the dedication of officers to specialized investigative functions. This would allow officers to develop expertise and to improve crime-solving capabilities. The study found an inverse relationship between the size variables and many of crime clearance rates. The inverse relationship challenges many of the assumptions about police investigations and determining why this occurs would be important to researchers and practitioners as they try to determine how best to accomplish one of the primary goals of modern policing: solving crime.

Related to this issue of an inverse relationship between agency size and crime clearance rates, is the question of why the agency size relationship is not significant in several (but not all) of the crime categories the study analyzes. Much of the historical discussion regarding agency size and quality of service has revolved around the nature and direction of the relationship. This study (and others) has argued that the relationship would be positive, while public choice proponents suggest the relationship might be an inverse one. Considering the ongoing debate, a finding that the size of an agency would not be influential seems improbable. If this is accurate, the lack of any significant relationship between agency size and effectiveness may add another dimension to the arguments over the most appropriate size of police agencies. If agency size plays no role in crime clearance, both public choice and regionalization advocates may have to amend their arguments and leave out the effectiveness argument when debating size of a police force.

A second area of concern is that even with the inclusion of 12 control variables (in addition to the size variables), most of the final models explain very little of the variation in the crime clearance rates. None of the final models had an

R-square that even approached 0.1, and many were much less. The “best” model is the model for percentage of felony assaults cleared, with an adjusted R-square of 0.08. The robbery model had an adjusted R-square of 0.06. The remainder of the analyses result in adjusted R-squares well below 0.05, with murder and rape having adjusted R-squares of only 0.02 and 0.01 respectively.

Improving the model’s ability to predict crime clearance rates is important for several reasons. Beyond the obvious value of giving researchers and practitioners a better understanding of the investigative process, increasing our ability to explain the crime clearance variance may also add some clarity to the role of agency size. As previously noted, the models with the highest adjusted R-square values (robbery and felony assault) are also the models where the role of size is significant. This suggests that size may be a significant factor in predicting the clearance rates for all crimes, but a better understanding of the other factors may be necessary to be able to realize the actual influence of agency size.

Examining the study’s findings reveals several potential changes that may strengthen the results of this study. As previously discussed, the low R-squares are a concern and may contribute to the lack of significance of the size variables in several of the analyses. One possible issue is some control variables may not adequately capture the effect the study intended them to capture. For example, this study recognizes that different communities may demand differing levels of service from their police agencies. This study theorizes that community size and characteristics such as rural, suburban, or urban relate to the type and amounts of services they expect.

To capture the role of community demand, the study uses percentage of

the population that is urban. In an attempt to capture more accurately the impact of community size, future research should consider running separate analyses for agencies based upon the size of the population they serve. Breaking down the analysis into small, medium, and large communities may reveal patterns related to community size not previously observed and increase the adjusted R-square. The inclusion of other community factors may also provide some improvement in the models ability to predict crime clearances by better capturing the effect of community preferences and demands. In addition to the size of a community, the demographics of the community may also be a factor. This study does include variables such as the percentage of the population that is black, percentage of the population in poverty, and percentage of the population that is urban in an attempt to capture some of the community demographics that research has linked to crime and clearance rates. However, researchers examining the role social disorganization in communities and crime have suggested other variables. For example, in addition to socio-economic status, Sampson and Groves (1989) used residential mobility, racial heterogeneity, and family disruption to test their model of social disorganization. Including some of these community characteristics may improve this study's overall model and future research should explore the role of these factors.

In addition to the community variables, there are also agency related variables that future research may want to consider. These include investigator experience, professionalism, and leadership structure of the agency. This study theorizes that experience is inherent in larger agencies, because they can dedicate personal to investigative functions and would handle more crime.

Capturing investigator experience is difficult, however researchers have developed several proxy measures for police officer experience. Marche (1994) suggests that jurisdictional population in which the incident occurs could serve as a proxy for experience. Marche notes that researchers looking at other professions have used jurisdictional population as a measure of experience, notably in the medical field. Other have used shift assignment as a proxy for experience, assuming the least senior investigators would be assigned to the night shifts (Puckett & Lundman, 2003). In addition to controlling for experience, exploring the possible relationship between agency structure and leadership may also be beneficial. For example, there may a difference between police and sheriff's agencies because of the nature of their leadership. Police chiefs typically serve at the discretion of community officials (i.e., mayor, manager, or administrator) while the sheriff is usually elected. The result is there may be different forms or levels of accountability and they may reflect in agency service levels and performance. Including agency leadership structure and investigator experience may improve this study's ability to predict crime clearance rates and merit future exploration.

The study also found widely varying results depending upon the crime type. For murder, one of the most frequently studied crimes, this study found relatively few factors influence clearance rates, despite the huge variance in the percentage of murders cleared by agencies in the data set. For other crimes, such as felony assaults or robbery, several factors significantly influence the crime clearance rates. For the property crimes, often considered the least serious crimes, many, if not all of the control variables are significant. Much of

the research on criminal investigations focuses on the high profile crime of murder. This is understandable, since this is the only crime in which the FBI collects and reports supplemental information beyond mere crime rates and clearances. Based on this and on other study's findings, murder investigations may not be typical of police investigative efforts and may not provide an accurate picture of the factors that can affect the police. Expanding research efforts to these other crimes may provide a more accurate glimpse of the many factors than can influence a typical police investigation.

To expand the research into some of the other crime categories requires more detailed information about the crimes than is often available. Historically, examining or considering the role of offense specific characteristics has been difficult for researchers. One of the most frequently used sources of crime data is the FBI's Uniform Crime Report. UCR data is summary in nature and even when offense specific data is collected (for example, supplementary homicide statistics), the summary nature of the data prevents researchers from fully examining the role of those characteristics in crime clearance. This is changing as the Uniform Crime Reporting Program continues to implement the National Incident-Based Reporting System (NIBRS). As the title suggests, NIBRS is incident based and presents more comprehensive, detailed information about crime incidents, including some offense specific characteristics. As more police agencies participate in the NIBRS program, researchers have a better opportunity to include the effects of offense specific characteristics in future studies.

By design, this study focuses solely on crime clearance, which is an output measure. While the police may find higher clearance rates desirable in and of

themselves, their true value may be their affect on local crime rates. James Q. Wilson (1975) argued that crime could be reduced if potential offenders believed apprehension and punishment was an inevitable consequence of their criminal action. Several recent studies suggest that increases in police activity can reduce crime (Marvell & Moody, 1996; Levitt, 1997; Kovandzic & Sloan, 2002). A logical next step is to explore the relationship between crime clearance rates and the amount of crime. This study's data set would allow for analysis of crime clearance and crime rates. However, the nature of the relationship will require a more complex analysis. Theoretically, crime clearance rates can influence crime rates, but crime rates may also influence crime clearance rates. Classical criminological theory predicts that police investigative efforts may affect crimes rates. However, changes in local crime rates may also motivate changes in police investigative efforts, that is, as crime rates increase, there may be increased pressure on the police to solve more crime. This complex relationship between crime clearance rates, crime rates and the community, agency, and workload variables is well suited for structural equation modeling. This technique can help answer the question of whether police investigative efforts can reduce crime.

Crime rates are not the only outcome measures used by researchers and communities in assessing the police. In recent years, administrators have increasingly used citizen surveys to gather information, assess citizen needs and preferences, to gauge citizen satisfaction levels, and as a subjective evaluation of governmental services. Additionally, a growing number of cities use citizen surveys as part of their performance monitoring process (Stipak, 1980).

However, there continues to be questions regarding the differences (or perceived differences) between citizen survey assessments and objective agency performance measures (Swindell & Kelly, 2000). Like the analysis of crime rates and clearance rates, future research may want to examine the relationship between citizen satisfaction survey results and clearance rates to answer the question of whether increased clearance rates positively impacts citizen's opinions of police agencies. Unfortunately, standardized citizen satisfaction data is not available on a national basis. However, many jurisdictions do utilize surveys and an analysis on a smaller scale may be feasible and valuable.

Although not a deficiency of this study, future research may also want to examine more fully the operations of the smallest police agencies. This study developed a database from the 2003 LEMAS data, which is a result of a survey of all police agencies with more than 100 officers and a random sampling of smaller departments. Of the 2,271 agencies includes in the final data set, about two thirds of those agencies have less than 100 officers. For perspective, nearly 95% of the 17,784 agencies listed in the 2000 CSLLEA survey have less than 100 officers. This means there are approximately 15,000 police agencies with less than 100 officers that are not included in the study's data set. Many studies of contemporary police agencies focus on larger agencies, often because there is little data available for smaller agencies. If, as the results of this study suggest, smaller agencies are more effective than larger agencies at clearing robberies, felony assaults and vehicle theft, then a better understanding of smaller agencies may be critical in understanding of police investigative efforts.

Finally, the lack of significance and the inconsistent effect of many of the

community policing variables was unexpected based upon the theory. Several of the community policing variables had little or no impact in nearly every analysis. For example, the percentage of community officers and the use of community policing strategies are each significant in only one crime category analysis. Community policing advocates have championed the many advantages of community policing, including improved relationships and increased community support. This improved relationship should result in greater sharing of information between the police and the community, ultimately resulting in solving more crimes. Findings consistent with those theories are not evident in this study's analyses. Admittedly, this study uses a limited set of variables in an attempt to include the effect of community policing efforts in the clearing of crimes. The reason for this lack of significance may be that this study's community policing variables are not well suited to capturing the factors and characteristics of community policing. But regardless of the reasons, the development of more accurate measures of community policing has become necessary to support nearly any research into police operations.

On a related note, the lack of significance of several of the community variables, combined with inconsistent results does invite more inquiry. For example, the percentage of the population that is black is significant in several analyses, but has both positive and negative coefficients. This means the study's model would either predict that an increase in the percentage of the population that is black could result in an increase or a decrease in crime clearance rates, depending upon the type of crime. The housing vacancy rate variable also has differing directions of influence, depending upon the crime type. This study

hypothesizes that these variables would have an impact, and recognizes that impact may vary, but did not foresee the differing directions of their impact. The percentage of the population that is black and the housing vacancy rate may influence criminal investigations in different directions depending upon the type of crime. However, the reason for these contradictory results is not evident from this study.

Overall, this study is able to address the primary question regarding the relationship between police agency size and their crime clearance rates for several crime types. However, the relationship is less clear for the many of crime types the study analyzes. This is an area that warrants further research. In addition, including the impact of other community and agency factors not in this study might enhance our understanding of the overall investigative process and may add some clarity to the role of police agency size on crime clearance rates.

Summary

This study attempts to add to the discussion regarding the importance of police agency size as the police try to accomplish their mission. The discussion has been ongoing for more than 50 years and is complicate by the varied and diverse police mission. The inherent difficulties in measuring and assessing police activities also complicates the debate. This study selected crime clearance rates as a measure of police effectiveness. The crime clearance data, obtained from the FBI's Uniform Crime Report (UCR), has been widely used as a measure of police effectiveness and despite some concerns, has been widely accepted by scholars and practitioners.

Using 2003 UCR, Law Enforcement Management and Administrative

Statistics (LEMAS) and US Census Bureau data, this study examines the impact of police agency size on the percentage of crimes cleared. The study uses both the number of sworn officers and the total number of employees as the independent variable and examines their impact on the clearance rates of seven Part I crimes: murder, rape, robbery, assault, burglary, larceny and vehicle theft. The study also controls for a variety of community, workload, and agency variables.

The study hypothesizes that as agency size increases, crime clearance rates will also increase. The study theorizes that as an agency increases in size, the agency can more effectively utilize staff, develop expertise, and take advantage of economies of scale. Using hierarchical regression, the control and size variables create models that are able to significantly improve upon the ability to predict crime clearance rates for every crime category. Based upon the standardized beta coefficients, the study finds that the relationship between size and crime clearance is negative in nearly every category. Only the size coefficients in the murder analysis and the sworn officer size coefficient in the larceny are positive. However, while the overall models are significant, the size variables are not significant in these three models.

For the crimes of robbery and felony assault, both the number of sworn officers and total number of employees contribute significantly to the final model. Additionally, the size variables are significant in predicting the clearance rate of vehicles thefts. In all of the significant cases, the size variable has a negative standardized coefficient, indicating an inverse relationship. That is, as agency size increases, the percentage off crimes cleared decreases. These findings are

contrary to the study's hypothesis.

The study's findings do not support the claims of supporters of larger, (i.e., consolidated or regional) police agencies that communities are more effectively served by larger agencies. The findings do add limited support to the public choice perspective by offering evidence that smaller agencies may be more effective at solving at least some types of crimes. The findings do not close or conclude the argument, and there are several areas that may warrant further or more in depth research. These include why smaller agencies are more successful at clearing some types of crime, as well as clarifying the role of several community policing tactics in solving crimes. More in depth research can examine the link between the clearance rates (an output measure) and outcomes, such as crime rates or citizen satisfaction. However, the findings do have implications for community leaders, especially smaller communities, as they try to determine how best to meet the needs of their citizens.

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FORMAL EDUCATION

University of North Carolina at Charlotte, Charlotte, NC
Doctor of Philosophy in Public Policy **2009**
Dissertation Title: "The Impact of Police Agency Size on Crime Clearance Rates"

University of Connecticut, Storrs, CT
Masters of Public Affairs **1994**

University of Connecticut, Storrs, CT
Bachelors of General Studies **1991**
Areas of Concentration: Mechanical Technology and Political Science
BGS Summary Project: "Police Services for Groton, Connecticut"

TEACHING EXPERIENCE

Central Piedmont Community College, Charlotte, NC
Criminal Justice Technology Instructor **2000 - Present**
Develops and teaches college level curriculum courses related to Law Enforcement and Criminal Justice Technology. Also teaches continuing education courses for police in-service classes as well as Basic Law Enforcement Training (BLET) classes. Other responsibilities include course development and evaluation, advising students and participating in activities that enhance the college's service to students and the community.

Charlotte Mecklenburg Police Department, Charlotte, NC
Police Technology Instructor **1999 - 2000**
State Certified "Basic Law Enforcement Training" Instructor. Involved in the development and delivery of training to all department employees regarding the use of emerging computer and computer-related technologies.

RELATED PROFESSIONAL EXPERIENCE

Charlotte Mecklenburg Police Department, Charlotte, NC
Manager - Crime Scene Search Section **1995 - 2000**
Overall responsibility for the Crime Scene Search section and the Forensic Photography Section of the department's Crime Laboratory Bureau. Duties include overseeing the daily operations of the unit, including managing and reviewing the work of all section employees, ensuring compliance with the department's mission statement and goals. Responsible for developing, administering and implementing the section budget, scheduling staff and all personnel matters, and reviews develops and implements procedures and

methods. Coordinates section activities with other bureaus and sections, as well as outside agencies.

Groton City Police Department, Groton, CT
Police Officer **1982 - 1994**

Responsible for law enforcement and protection of the rights of individuals. Conducts investigations into crimes, identifies criminal offenders and criminal activity: where appropriate apprehends or arrests offenders. Patrols to reduce opportunity for commission of crime, resolves conflicts, and identifies problems that are potentially serious law enforcement or government matters. Creates and maintains a feeling of security in the community.

OTHER TRAINING AND EXPERIENCE

- Investigator, Connecticut Superior Court, State's Attorney's Office. 1988 - 1989.
- Investigator, State Of Connecticut, Statewide Narcotics Task Force. 1987 - 1988.
- Field Training Officer. Responsible for field training and evaluation of new police officers.
- Traffic Accident Investigation Team Member. Specialty training in accident investigation and reconstruction. Investigated serious traffic accidents.
- Dive Rescue and Recovery Team Member. Certified SCUBA diver with supplemental specialty training.
- Liaison Officer, Regional Police Helicopter Program. Responsible for coordinating helicopter and department activities and needs and served as a flight crew member.
- Police Recruit Training Course, 169th Session, Connecticut Police Academy, Meriden, CT. 1983

COURSES TAUGHT

- CJC 111 - Introduction to Criminal Justice
- CJC 112 - Criminology
- CJC 114 - Investigative Photography
- CJC 121 - Law Enforcement Operations
- CJC 122 - Community Policing
- CJC 141 - Corrections
- CJC 144 - Crime Scene Processing
- CJC 214 - Victimology
- CJC 221 - Investigative Principles
- CJC 222 - Criminalistics
- CJC 223 - Organized Crime

MEMBERSHIPS

- International Association of Identification
- The Academy of Criminal Justice Sciences