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An Empirical Assessment of NYPD's "Operation Impact": A Targeted Zone Crime Reduction Strategy

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EXECUTIVE SUMMARY

About a decade ago one of the leading students of policing in America, David Bayley in a widely-praised book, Police for the Future, wrote "The Police do not prevent crime. This is one of the best kept secrets of modern life. Experts know it, the police know it, yet the police pretend that they are society's best defense against crime." In making this observation about the "myth" that police prevent crime Bayley was echoing the conclusion written more than two decades earlier of another distinguished expert, James Q. Wilson, who wrote in his pioneering empirical study of eight police departments, Varieties of Police Behavior, that the police administrator "is in the unhappy position of being responsible for an organization that lacks a proven technology for achieving its purpose". [1] Bayley was in the position to go further than Wilson and base his conclusion on research that "consistently failed to find any connection between the number of police officers and crime rates," and studies of "primary strategies adopted by modern police" that found "little or no effect on crime".[2]

In the past decade and a half in the crime laboratory called New York City, these dire assessments of the plight of the police and by extension of the public have undergone a substantial revision. At the time Bayley published his commentary on the myth of police efficacy in preventing crime, New York City had used new police resources provided by Safe Streets, Safe City and a new police strategy called "community policing" to begin a reversal of an upward crime trend that had

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[1] Wilson, 1968,63.
[2] Bayley, 1994, 3.

lasted more than a decade, and peaked in 1990 with more than 2,200 homicides. In 1993, a new anti-corruption system that would over time produce a two-thirds reduction in complaints of police corruption had been designed and implemented by then Police Commissioner Raymond Kelly, and in 1994 a new management system at the City, Borough, and Precinct level was being introduced that committed the police to fighting crime as the highest priority. Since then, crime has dramatically declined in every borough and every precinct in the City.

The remarkable achievement of crime reductions achieved from 1988 though 2001, led many to question whether it would be possible for a new administration to continue the relentless downward trend in crime.

The fear that crime had been brought down as much as was possible was not entirely unreasonable. Criminologists have long tracked the cyclical nature of crime patterns, and most people instinctively understand the economic concept of a "declining marginal return on investment," the idea that "low hanging fruit" are found and harvested first, and that the challenges of production grow increasingly more difficult after that. For those who firmly believe, despite evidence, that the economy in New York rebounded *after* crime came down, that economic trends explain the crime rate, the economic downturn following the 911 attack further fueled pessimism about the prospects of continuing the successful fight against crime in New York.

Across the United States, the skepticism expressed in New York has been validated in cities large and small. After a decade long decline in crime in America's big cities, recent national crime statistics show a disturbing upward turn. An October, 2006, Police Executive Research Forum report, "A Gathering Storm: Violent Crime in America," documents that shift, which it finds became evident in the 2005 crime statistics.

New York City, which led the national decline, is an exception to this much noted reversal. The New York Times reported in late March, 2007, homicides in New York City were averaging fewer than one per day. Although by the end of May, with the City was recording slightly more than one murder per day, the trend is downward by almost 17% in the first five months of the year. As of the end of May, 2007, NYPD showed an almost 9% drop in total major crimes for the year to date.

When crime declined over the past decade, some criminologists pointed to declines in other cities, even though they were less than New York's, to say that NYC was part of a national trend, and thus discounted claims that anything special had been accomplished by NYPD. Now that New York is clearly not following the national pattern, attention returns to the question: what is New York doing to reduce crime?

This is a report on an evaluation of the City's primary program directed at violent crime reduction, Operation Impact. Since the start of the Bloomberg administration, NYPD Police Commissioner Raymond Kelly has pursued a strategy called "hot-spots policing." By 2002, evidence had accumulated from seven rigorous studies that "hot-spots policing" produced crime reductions in cities other than New York. (Braga, 2003) Operation Impact deploys most members of the graduating classes of NYPD's recruit-training Academy in units to carefully selected "hot spots" in precincts around the City, under close monitoring and supervision to focus on particular times, places and types of crime that have been found to be concentrated in those locations.

Operation Impact in New York City reveals vividly how far the field of police management has developed in the decades since James Q. Wilson reported that all that police administrators and their departments can try to do is "cope" with crime.

Wilson observed at the end of the 1960s that "few police administrators show much interest in 'planning' the deployment of their manpower and equipment. There is no information—and in the nature of the case, there can never be sufficient information—on the effects of alternative police strategies on the several kinds of crime." [3]

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[3] James Q. Wilson, Varieties of Police Behavior (Cambridge, 1968, 60)

Despite the overall and nearly ubiquitous pattern of crime reduction the City has achieved, there is still serious crime in New York, and it is not randomly distributed. In 2001, the last year of the Giuliani administration, the full year of crime data available when NYPD was planning the launch of Operation Impact, there were 162,064 major crimes reported in New York City. In the planning phase of hot spots policing deployment, crime data were analyzed to find small areas of the City that reported not only disproportionate amounts of crime, especially crimes against persons, but also patterns of crime that were concentrated in a few square blocks. Our analysis using precinct-level monthly crime-data from 1990 to 2006 showed that the precincts chosen for Impact Zones had higher rates of crime, that crime was declining in those precincts faster than the rate for the City overall. We also found that the rate of crime decline was itself slowing over time, with the Impact Zones slowing even faster than the rest of the City.[4]

In the first year of Operation Impact, Zones were created in nineteen of NYPD's seventy-six precincts. Those nineteen precincts (25% of the City's police districts) accounted for 43% of the murders reported in 2001, 39% of the rapes, 28% of robberies, 39% of felony assaults, 34% of burglaries, 32% of grand larcenies, and 30% of automobiles thefts citywide. In contrast to the flying blind days of police management observed by James Q. Wilson, NYPD developed a

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[4] This imbedded dynamic pattern of crime made any evaluation of impact of an intervention triply complex: any changes in the precincts with Zones had to be seen in the context of the overall City trends, the specific precinct trends, and the fact that rates of change were changing at different rates for different crimes, in different parts of the City.

virtual mountain of analysis, prepared at all levels of the Department, in preparation for deploying graduates from the Academy to Impact Zones selected on the basis of intense scrutiny of crime patterns. Equally striking given the absence of crime-data analysis when Wilson did his study is the amount of real time scrutiny at every level of NYPD used to monitor Impact Zone operations and results during their implementation. Operation Impact is outcome performance management, symbolized by the police management practice called CompStat, on steroids.

Since 2003, Zones have been introduced in eleven additional precincts, some zones have been modified or ended, and zones in some precincts have been interrupted and restarted, based on analysis and available resources. In three precincts, where crime was high but not concentrated in small sub-areas, all alternative approach to concentrating police attention to fighting crime was implemented as a variant of Impact Zone policing. Over time, aspects of the Impact operating rules, such as the ability of commanders to shift the boundaries or time of operation of Zones based on crime patterns, have been modified.

No special study was needed to document the fact that during the past five years of the Bloomberg Administration crime has continued to decline while it was reportedly increasing in many other major cities. Those numbers are readily available and widely reported. Our task was to answer the question, "How successful has Operation Impact been as a strategy for continued crime

reduction in New York?" The simple answer is that Operation Impact, using a small fraction of the City's total police force, focused on a very small fraction the total area policed by NYPD, has been consistently successful throughout its implementation in all precincts for all categories of violent crime. Since crime was already coming down when Operation Impact was inaugurated (although at a rate that was declining over time), "success" has to be defined in terms of its effect on the existing downward trajectory of crime. Precincts that were assigned Impact Zones starting in 2003 experienced a 24% acceleration in declining murder rates, a more than doubling of the rate of decline in rapes and grand larcenies, a 21% boost in the decline of robbery rate and of 23% in assault rate by 2006. Automobile theft which, as a property crime, and as a crime that has almost disappeared citywide (down almost 90% in most precincts) was not a priority focus of Operation Impact, alone among major crimes did not show an accelerated decline in Impact Zone precincts.

Clearly in a time of shrinking resources, Operation Impact has earned its place as an empirically-validated crime-reduction tool worthy of continued adaptation in New York, and emulation in other cities facing resurgent crime, if they have the capacity to replicate the kind of careful analysis on which the implementation of Operation Impact was launched and its implementation has been tracked and managed.

Introduction

Despite the historic nature of the decline in crime that has occurred in America's largest city and the extraordinary amount of attention it has received, there remain many persistent myths about that history, and not a few surprises. Since the media and the public failed to notice when crime started its consistent downward trend (in the Dinkins administration, *not* the Giuliani administration) from its peak in the late 1980s and 1990, when there were more than 2,220 homicides reported in New York City, they were not prepared to believe the announced -- and achieved ---crime reduction target of more than 10% that occurred in 1994, the first year of the Giuliani administration, nor the continued decline each year of his two terms in office.

Related to the disbelief in the reality of crime reduction is the entrenched resistance among some scholars and some critics of police to accept the idea that police policies and management are responsible for a significant amount of the crime decline that has occurred. Criminologists and others have been resourceful in generating alternative hypotheses to explain the drop in crime, and have gone to great, some would say heroic, lengths to find evidence that supports their rival hypotheses.[5]

A new skepticism about the role of police in crime fighting was introduced the end of the Giuliani administration. With 1990 to 2002 reductions in all categories

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[5] Leavitt, Steven, D., "Understanding Why Crime Fell in the 1990s: Four Factors that Explain the Decline and Six that Do Not," Journal of Economic Perspectives, Volume 18, Number 1, Winter 2004.

of crime of between 50 and 90 percent, many questioned how much longer crime could continue to decline in New York. This skepticism was further fueled by a realization, particularly for those that believed that the police deserved the lion share of credit that, in the wake of the terrorist attack of 9/11, significant police attention and resources would be diverted from crime fighting to counterterrorism. Furthermore, in the post-9/11 economy, there was realistic concern that sustaining the level of police staffing achieved in the 1990s would be difficult. Finally, Mayor Giuliani ran for office on a claim that he was uniquely "tough on crime," and some doubted that any other Mayor, especially in view of the reduced sense of a crime crisis, would assign fighting crime the same high priority.

Across the United States, the skepticism expressed in New York has been validated in cities large and small. After a decade long decline in crime in America's big cities, recent national crime-statistics show a disturbing upward turn. An October, 2006 Police Executive Research Forum report, "A Gathering Storm: Violent Crime in America," documents that shift, which it finds became evident in the 2005 crime-statistics.

New York City, which led the national decline, is an exception to this much noted reversal. In 1990 New York City averaged more than six murders per day. As of late May, 2007, NYPD reported that crime is down in all categories, with an overall 8.63% drop in major crimes. While it proved impossible to sustain, The

New York Times reported in late March that homicides in New York City this year averaged less than one per day. Murder in New York City, which has dropped 82% since 1990, is now tracking at slightly *more* than one per day, has declined an additional 17% in the first five months of 2007. New York City remains the safest large city in America.

When crime declined over the past decade, some criminologists pointed to declines in other cities, even though they were less than New York's, to say that NYC was part of a national trend. They attempted to discount claims that anything special had been accomplished by NYPD. Now that New York is clearly not following the national pattern, attention returns to the question: what is New York City doing to reduce crime? This is a report on an evaluation of the City's primary program directed at violent crime reduction, Operation IMPACT.

Crime Reduction in New York City

The police officials from around the nation whose experience and views are reported in PERF's "A Gathering Storm" attributed the reversal in the declining crime trend to a host of factors, including decreasing police staff, increasing demand for other police services, the ready availability of guns, increasingly violent strains in the youth culture, declining federal funding for policing coupled with increased demand for local-police attention to homeland-security concerns,

resurgent drug use, especially methamphetamines, and increasing prisoner re-entry into society in the wake of a several decade-long surge in incarceration.

While the PERF report does not quantify most of these factors or examine their variability across jurisdictions, there is no apparent reason to doubt that these factors are present in New York. Gun availability, for example, is such a problem that the Mayor and Police Commissioner of New York are leading a national effort to change gun policy. NYPD had more than 4,000 fewer uniformed officers in 2006 (36,101) than were in service in 2000 (40,311), and has devoted upwards of 1,000 of that reduced force to counter terrorism and intelligence units. The decline in Federal funding for local police has been painfully felt in New York, and the Mayor of New York has consistently petitioned Congress for a fairer share of homeland security funding for the only American city that has experienced two terrorist attacks. If the factors listed in the PERF reports were determinate of crime patterns, it seems likely that New York City would also be experiencing a crime-trend reversal.

Starting with Safe Streets, Safe City and the introduction of community policing in the early 1990s, New York City made crime reduction --- not just responding to crime --- its goal. Building on the crime reductions begun in the Dinkins administration, using the performance management reform CompStat, the NYPD has achieved consistent, continuing crime-reduction and public-safety

improvement of historic proportions.[6] This has been achieved while the City has faced the quantum change in the challenge to public-safety posed by the discovery of modern technology by global terrorist-organizations, and their apparent selection of New York City as a prime target. However, the Department could not -- and did not -- rest on its laurels.

While major crime over the past decade has been reduced by more than two thirds overall, (down from 527,257 major reported crimes in 1990), and by more in some parts of the City and in some categories, each year when the totals are in, there remain thousands of robberies and hundreds of murders. In 2001, the last year of the Giuliani administration, there were 162,064 major crimes reported in New York City. To sustain the downward trajectory of reported crime and the upward trend in confidence in public safety, as the City has done even since 9/11, required a relentless search for new sources of leverage in the quest for effectiveness and efficiency. At the start of the Bloomberg Administration, Police Commissioner Raymond Kelly identified one possible contributor to improved effectiveness: the Department's resource-deployment strategy. Turning the tables on modern day Willie Suttons, who reportedly said he robbed banks because "that is where the money is," NYPD has been concentrating new police staff resources as they become available on remaining, empirically mapped "hot spots" because that is where the crime is. On reflection, it is difficult to imagine a

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[6] Thomas J. Lueck, "Serious Crime Declines Again in New York at a Rate Outpacing the Nation's," *New York Times*, June 7, 2005.

more productive post-Academy training environment for "rookie" police officers than their closely-supervised crime "hot spots".[7]

What is Operation Impact?

Since the start of the Bloomberg Administration, Police Commissioner Raymond Kelly has assigned new personnel resources as they emerge from the NYPD Academy to sometimes very small sub-areas of precincts where crime rates were relatively higher than they were for the City as a whole. When this study began, this new strategy, named "Operation Impact," was in its third year. The initial results appeared to be clearly positive. Crime consistently declined in the targeted, "Impact Zone" areas more than in the rest of the City.

> The NYPD reduced crime within the Impact Zones by 26% in 2004 by tracking crimes, enforcement and deployment on a daily basis, placing highly visible Field Command Posts throughout the Impact Zones and conducting daily intelligence briefings to examine current crime trends and conditions. Operation Impact targeted gangs and narcotics, as well as identified and apprehending individuals with outstanding warrants for past crimes. In all, Operation Impact resulted in over 33,438 arrests and almost 360,308 summonses in Impact Zones Citywide in 2004. Operation Impact helped drive overall crime down 5% last year, 14% over the last three years and also contributed to reducing the number of murders to the lowest level since 1963. The key element of the success of Operation Impact is shifting to meet an area's needs. (NEWS from the BLUE ROOM, January 13, 2005)

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[7] Another result of Operation Impact worthy of study is its efficacy as a training strategy. In discussions with precinct commanders it was clear that they counted, and took pride in, the number of Impact Zone officers they were able to retain after they completed their Zone assignment.

Operation Impact has varied in the number and location of Zones since it began in 2003, with local proposed, but centrally approved, adjustments during implementation, and intensive review and possible revision each time a new cadet class graduated from the academy.[8] In contrast to the plan-less, data-less and presumably clueless police managers of James Q. Wilson's study in the 1960s, NYPD approaches each Impact deployment with analyses at the precinct, borough, and headquarters levels, complete with competing computer graphic presentations to make the case for favored Zones. The issues addressed are types of crime, clusters in place, time and form, as well as insights into local crime history. To a degree that is unimaginable in the early 1990s when NYPD was entirely dependent on centralize mainframe computer analyses of crime statistics by the Management Information Systems Division at NYPD headquarters, Operation Impact has converted NYPD into a pervasively evidence-driven crime-fighting agency, even at the lowest levels of the Department.

By January 2005, Operation Impact, in it fourth refinement, covered 20 Zones. Some Zones were entirely within precincts and some, based on crime patterns, were constructed across precinct boundaries. Zones also operated in targeted areas in two Housing Commands. Through 2006, Impact Zones have been

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[8] Precinct commanders interviewed were uniformly enthusiastic about Operation Impact, and the fact that they were part of it, but did voice some reservations about the about of central control exercised over the definition of boundaries. They wanted to be able to make adjustments, for example in block parameters of Zones, without awaiting approval from headquarters. This was a difficult feature of the program to relax because the idea was to test the efficacy of sustained policing in a fixed area and time. By the time of the study some experimentation with limited local discretion was being tested.

deployed in 30 precincts. Eleven precincts have had Zones continuously since the inception of the program. The small areas and shifting boundaries over time posed both opportunities and challenges for evaluation of the intervention's impact.

A special variant of Operation Impact was created first for use in one of the City's highest crime precincts, the 75th in East New York, and subsequently two others in the Bronx, the 44rd and 46th. At the time that a new approach to policing hot spots was introduced in the 75th precinct, it had witnessed a 12% decline major crime and a 17% drop in murder, but "still leads the City in homicides, robberies and assaults."[9]   While overall crime in the East New York precinct was certainly high enough to warrant an Impact Zone, the patterns were less concentrated than in some other precincts. To address the diffuse pattern of crime in the 75th Precinct, the Department launched Operation Trident which divided the 5.6 square miles of the precinct into three separate areas, each under a Police Captain. Like other Impact Zones, these three areas received additional police resources to "cut down crime, reduce response time, and maximize assets". In the original small-area hot-spots, Zone officers were expected to remain in their assigned small areas, and their adherence to this assignment was closely monitored. In Trident in East New York, and in the bisected precincts in the Bronx, officers are assigned to specific sections of the precinct and were directed not to leave their assigned areas. This variation of Operation Impact demonstrated the flexibility of the Department's approach to hot-spots policing,

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[9] NEWS from the BLUE ROOM, January 13, 2005. http://www.nyc/recent_events.html

but also reflects the challenges posed by the diversity of patterns of life in the City, and crime patterns.

The Research on Hot Spots Policing

All of these efforts by NYPD to target limited resources and to focus attention on the remaining areas of relatively high crime concentrations in the City build upon a growing body of evidence that suggest that targeting police-enforcement efforts on geographic "hot spots" is a particularly effective crime-reduction strategy. This is the conclusion of a national panel of police research experts who reviewed all published empirical studies of policing completed since 1968. The National Research Council review of studies on police effectiveness, which appeared in 2004, well after NYPD launched Operation Impact, found that few police interventions demonstrably work, but it reported that research has shown that *hot-spots policing can effectively reduce crime and disorder.* The report and an earlier review of hot-spot policing studies by Braga, examined randomized experiments in Minneapolis (2), Jersey City and Kansas City (2), as well as quasi-experiments in St. Louis, Kansas City and Houston. (See Braga, 2001) These studies offer evidence that focused police actions can prevent crime, or at least reduce 911 crime calls. Unfortunately, although the best evidence available in support of an existing crime-fighting strategy, these studies were not focused on America's largest cities (only Houston is larger than New York's smallest borough), some focused on a specific type of crime only, none examined effects over an extended period of time (the experiments were for less than a year), and

told us little about what specific types of interventions are most effective at reducing crime in hot spots.

The emergence of place-based, geographic focused approaches to crime reduction is one of the most important changes in American policing in the last decade. In a recent police foundation study, 70% of police departments with more than 100 officers reported using crime-mapping to identify hot spots[10]   The important question is, of course, what to do with these hot-spots once they are identified, and what happens when this focus is adopted. The 2001 study did not address these questions.

In Weisburd and Braga's 2006 summary of hot-spot policing research, the emergence of hot-spots policing is traced to a combination of theory and technology in the 1980s and early 1990s.[11] The foundation for hot-spots policing, according to these authors, was laid by the intersection of problem-oriented approaches to policing of Goldstein and work on situational crime-prevention-theory by Clarke,[12] and a growing body of empirical evidence showing the disproportionately high concentration of crimes in discrete places like street corners or apartment buildings. In particular, these studies showed that crime is concentrated in specific places in the urban landscape, and that both "good" and "bad" neighborhoods contained areas relatively free of crime and disorder, as

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[10] Weisburd, Mastrofski and Greenspan, 2001.

[11] Weisburd, David and Braga A., ed., Police Innovation (Cambridge University Press, 2006)

[12] Herman Goldstein, Problem Oriented Policing (Tempe University Press, 1990) and R. V. Clarke, Situational Crime Prevention,

well as areas with disproportionately high levels of crime and disorder.[13]   They note that one implication of situational crime-prevention is that by preventing victims and offenders from converging in time and space, police can reduce crime. The essential conclusion of hot-spot policing is that police could be more effective if they focused resources and strategies on these crime hot-spots. This has never been attempted on the scale, intensity or duration of Operation Impact in New York City.

The technological innovation that led to the growth and adoption of hot-spots policing by many police agencies was the development of computerized crime-mapping programs that made it practical for these agencies to develop timely geographic representations of crime in their communities. While CompStat used mapping in the management of crime-reduction efforts in New York, its use did not precisely or consistently follow the model of concentrated deployment of resources on targeted small areas that is central to Operation Impact's model of hot-spots policing.

New York City's robust and extended "experiment" in hot-spot policing offers an opportunity to build on existing research and to answer questions not addressed in the literature.

An Empirical Assessment of Operation Impact: Hot Spots Policing in New York City

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[13] They cite Lawrence Sherman, et al., 1989;Weisburd and Green, 1994; Spelman, 1995; Swartz, 2000

This report presents findings from a study of the impact on crime of the introduction of hot spots policing Zones in ultimately thirty of the seventy-six NYPD precincts, using cross-sectional monthly crime-and-staffing panel-data from 1990 through 2006 in an interrupted time-series evaluation using maximum likelihood expectations. With additional data from interviews with precinct commanders, field observations, and internal planning documents, the study also analyzes the effect of Impact interventions to determine whether it is equally effective and enduringly effective in reducing all types of crimes in all parts of the City where it has been deployed.

We analyzed crime, staffing and other precinct and Zone level data using a variety of statistical measures to assess the impact of Operation Impact, including Trident in East New York and the special versions of Impact in two precincts in the Bronx. We interviewed and observed officials in the various Impact Zones to obtain a more complete portrait of the implementation of crime reduction strategies. During the data-analysis phase of the project we met regularly with NYPD staff to provide preliminary results and obtained midcourse guidance in order to guarantee the maximum utility of the assessment.

The Analytic Problem Facing an Empirical Assessment of Operation Impact

We were asked to evaluate rigorously the effectiveness of Operation Impact, NYPD's Hot Spots Policing Zone strategy. As with all modern empirical policy or program evaluations using social-science research methods, the challenge was to isolate the effects of the intervention from all other major factors that might

constitute alternative explanations of what is observed. The first question is usually the easiest: "did the targeted condition change in the desired and intended direction"? Second, "is the intervention the only plausible explanation for the change"? To answer that question, we needed to segregate the underlying trend in New York City crime for the city as a whole and in the precincts that were ultimately selected for Impact Zone interventions from the impact of hot-spots policing. We did that by modeling three levels of trend.

First, we estimated the trend in crime for the city as a whole without regard to hot-spot policing. Second, we asked if and how crime rates in the precincts selected for hot-spot policing differed from the city as a whole prior to the introduction of the Impact Zones. Finally, we evaluated the incremental impact of the Impact Zone interventions including, where the data allowed, the trend in crime in Impact-Zone precincts when Zones were either suspended or terminated. As described below, we also tested for pre- and post- hot-spots differences at the precinct level and based on the year the NYPD elected to introduce Zones into the precincts.

To prevent crime counts in higher-population precincts from biasing the analysis, we converted gross crime counts into crime rates per thousand people in each precinct. Monthly population estimates were based on population data by precinct as reported by the United States Census Bureau in the 1990 and 2000

Table 1 - Police Precincts with Impact Zones

Number of Months with Active Zones 2003 to 2006

Precinct	2003	2004	2005	2006
14	12	12	12	12
18	0	0	0	5.75 **Start 7/10**
19	12	12	6.5 **End 7/17**	0
23	12	12	12	0
25	0	12	0	0
28	0	0	0	6 **End 7/09**
32	12	12	12	12
40	0	0	12	0
43	12	7.5 **End 7/10**	0	0
44	0	0	7.5 **End 7/17**	12
46	12	12	7.5 **End 7/17**	12
47	0	12	0	0
52	12	12	7.5 **End 7/17**	5.75 **Start 7/10**
67	12	12	7.5 **End 7/17**	12
70	12	12	12	12
71	12	12	0	0
73	12	12	12	12
75	12	12	0	12
77	12	12	7.5 **End 7/17**	0
79	6 **Start 7/01**	0.5 **End 1/11**	5.5 **Start 7/18**	12
83	0	0	7.5 **End 7/17**	0
90	0	0	5.5 **Start 7/18**	0
102	12	12	0	0
103	12	12	12	12
104	0	12	7.5 **End 7/17**	0
107	0	9 **Start 4/01**	0	0
109	12	0.5 **End 1/11**	0	0
110	0	12	12	12
115	12	0.5 **End 1/11**	0	6.75 **Start 7/09**
120	12	12	7.5 **End 7/17**	0
Active Prec	19	24	19	15
Started in	19	5	4	2
Non-zone Precincts	57	52	57	61
Total	76	76	76	76

censuses. Population numbers for non-census-reporting periods were estimated using the compound annual population growth rates derived from precinct-level census numbers. Precinct-level census and the compound annual-population-growth estimates used in the study are included in Appendix 1.

As Table 1 shows, Impact Zones were implemented in a total of thirty of the city's seventy-six precincts between 2003 and 2006. Consistent with a targeted management-strategy, zone police activity varied by precinct and by year. The evaluation presented here was complicated by the staggered start and stop dates and the varying lengths and timing of the interventions that are shown in the Table. Those variations made it impossible to isolate the impact of the hot-spot strategy in each year from the effect of the varied start dates, changing intervention intensities and the impact of differential Zone durations on the measured effect of the strategy. While, the results presented below suggest there was little variation in impact either by precinct or start year, we cannot say with certainty if and how the pattern of Impact Zone interventions affected the overall estimates of the program's effectiveness or the year-to-year results estimated.

The map in Figure 1 reveals the highly concentrated nature of Impact deployments. With the exception of the three precincts noted earlier that were designed as fractions of the whole, typical Zones comprised an almost minuscule portion, a few square blocks, of the area in a precinct. Even in the precincts with bisected or trisected Zones, police managers did not randomly deploy the Impact

Zone police they were allocated but assigned them to variable -- rather than fixed

-- priority areas of concern based on ongoing crime-analysis in the precinct.

Figure 1
Hot-Spots Policing Deployment Areas
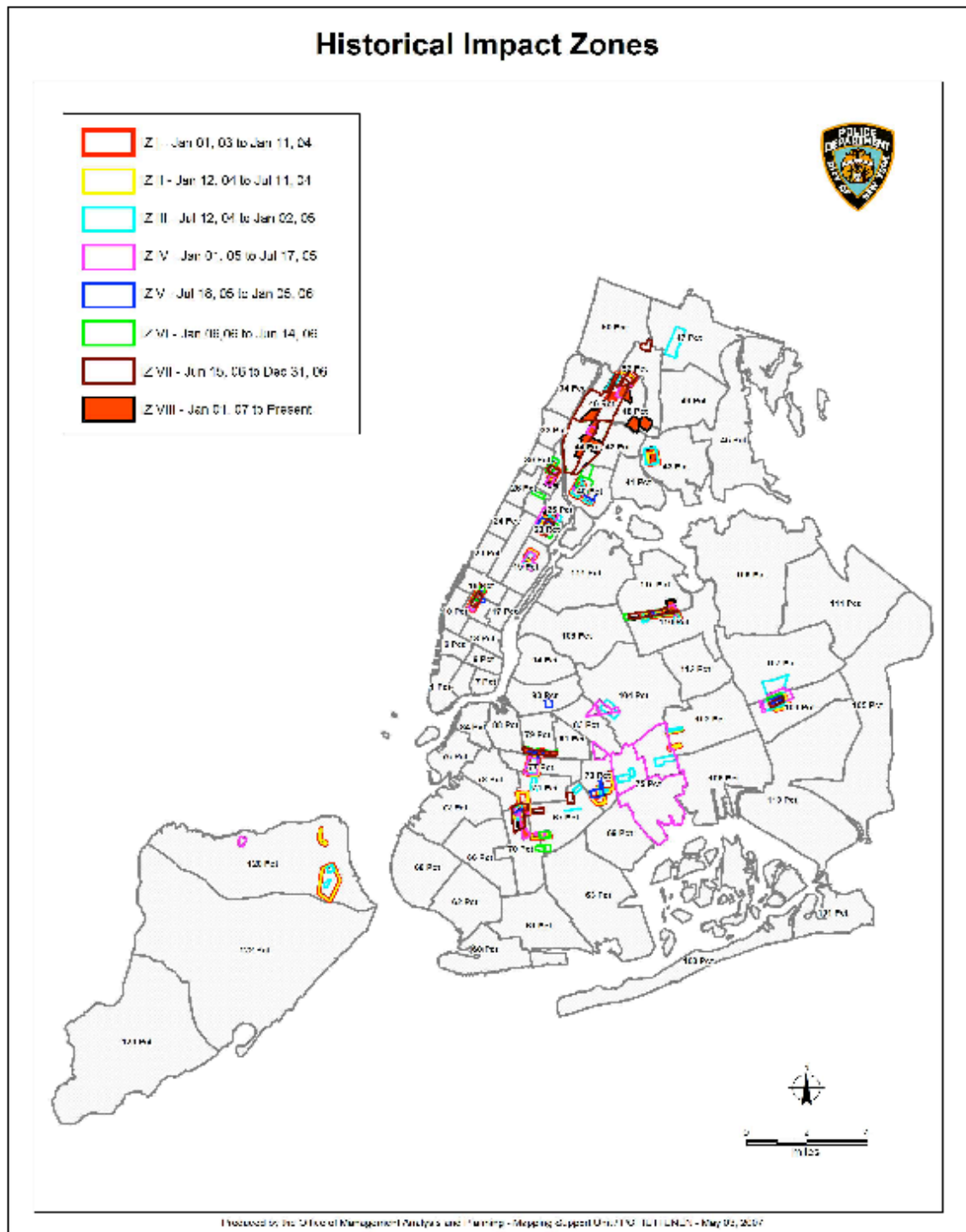
The Data Set

Our analysis was based on seven longitudinal crime-rate time-series produced by the NYPD's Crime Reporting system. The data included 202 monthly observations of each of the seven major crimes – murder, rape, robbery, burglary, grand larceny, felony assault, and auto theft – for seventy-three of the City's seventy-six precincts covering the period April 1990 to December 2006. We excluded the 22nd Precinct encompassing Central Park from our analysis because there are no population statistics from which to calculate crime rates. We also excluded the 33rd and 34th Precincts – Washington Heights and Inwood - which were carved out of the 34th precinct in 1994. As a result of that carve out, neither crime nor population statistics were available for the all of the time periods used in the analysis.

Because the Crime Reporting system records crimes in their original classification period and corrections in the period when they are approved, there were periods in the data set when reported crime-rates were less than zero. When that occurred, we set the crime rate equal to zero. Comparisons of analyses done before and after these changes were not materially different. However, we were unable to identify the periods when these overstatements occurred. As a result, crime rates in those periods have not been adjusted. These changes did not involve a substantive number of periods for most crime rates. However, 99 entries out of a total of 14,744 total observations were changed for murder and 400 were changed for rape. We cannot rule out that this

small number of reclassification changes had *some* impact on reported results but we do not expect the effects to be material.

The Evaluation Model

We employed a panel-data formulation of an interrupted-time-series model in our analysis. In its most general form, that model contains variables that relate to overall city trends, pre-Impact-Zone trends in the hot-spot precincts and post-Impact-Zone trends in the hot-spot precincts. Our analysis involved doing separate evaluations of the impact of the hot-spots intervention for each of the seven major crimes.

In its most general form, the model we used for the analysis is a follows:

Crime rate = pre-intervention city-wide components

$\qquad$ + pre-intervention zone-precinct components

$\qquad$ + post-intervention zone-precinct components

Where the pre-intervention city-wide components are:

$\qquad$ Constant $+ B_1 *$ period $+ B_2 *$ period_sq

The pre-intervention zone-precinct components are:

$\qquad$ $+ B_3 *$ z_noz $+ B_4 *$ znz_time $+ B_5 *$ znz_per2 $\qquad$ (2003 zones)

$\qquad$ $+ B_6 *$ time_2004 $+ B_7 *$ z2004_per2 $\qquad$ (2004 zones)

$\qquad$ $+ B_8 *$ time_2005 $+ B_9 *$ z2005_per2 $\qquad$ (2005 zones)

$\qquad$ $+ B_{10} *$ time_2006 $+ B_{11} *$ z2006_per2 $\qquad$ (2006 zones)

The Hot-Spots impact components of the model are:

$\qquad$ + B_{12} * z_active + B_{13} * active_time $\qquad$ (impact measures)

$\qquad$ + B_{14} * md_pst_per $\qquad$ (zone-ended measure)

Definitions of each of the variables and their interpretation are presented in Table 2.