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An Assessment of the Chandler Police Department's Operation Restoration

Prepared for the
Chandler, Arizona Police Department

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Administration of Justice

ARIZONA STATE
UNIVERSITY WEST

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EXECUTIVE SUMMARY

Background

This report is based on a two and half year study of the Chandler, Arizona Police Department's Operation Restoration. Operation Restoration consisted of a quality-of-life initiative that focused police departmental resources on physical and social disorder in the Redevelopment District of the City of Chandler. Chief of Police Bobby J. Harris commissioned the study for the purpose of evaluating the effectiveness of the Operation. In particular, the Chief was interested in understanding the impact that Operation Restoration had on disorder and crime in the area targeted by the police department.

Methodology

We examined the impact of the intervention on crime and disorder using calls for service (CFS) data obtained from the Chandler Police Department's crime analysis unit. The CFS data were collected from April 29, 1996 through September 26, 1999 for a total of 1,245 days. This includes data for a period of 363 days prior to the first intervention and 361 days following the last intervention. We examined changes in CFS for ten offense categories: (1) person crime, (2) property crime, (3) drug crime, (4) suspicious persons, (5) assistance, (6) public morals, (7) physical disorder, (8) nuisance, (9) disorderly conduct, and (10) traffic. The final data set included a total of 47,270 calls for service in the Redevelopment District over the 1,245-day period.

Summary of Major Findings

- Operation Restoration had the strongest impact on three categories of crime and disorder: public morals, disorderly conduct, and physical disorder. In general we found that the intervention resulted in an abrupt and permanent decrease in public morals calls for service. Additionally, we found that the intervention led to a temporary decrease in disorderly conduct. Last, we found that the amount of physical disorder in the Redevelopment District was greatly reduced as a consequence of the project.

- Operation Restoration did not have a substantial impact on serious crime such as crimes against persons and property crime.

- We found strong evidence of a diffusion of benefits to near-by areas outside of the Redevelopment District. In particular, we found that the project had a positive impact on the area just outside of the intervention area for public morals crimes and physical disorder.

- We found evidence that some crime was displaced to areas just outside of the Redevelopment District. Specifically, the data revealed that traffic, drug problems, and calls for assistance were displaced to contiguous areas.

Recommendations

In the future we suggest that the department re-examine the impact of the Operation on crime and disorder in the Redevelopment District. While we used a relatively long post-intervention period (i.e., approximately one year) to examine the impact of the project on serious crime, it may take a longer period of time to observe such change. It may take a substantial amount of time for residents and neighborhoods to re-establish the type and level of orderliness that leads to residents feeling safe and able to enforce local social norms, which is believed to lead to a reduction in serious crime. We also suggest that the police department survey residents in the Redevelopment District. The survey may provide the department with additional information on resident's perceptions of disorder, crime, and fear of crime. It may also be helpful in understanding resident's perceptions of the Operation. For instance, are the residents in the District satisfied with the Operation; are minority citizens just as satisfied with the Operation as white residents?

Conclusion

The findings presented here indicate that Operation Restoration had a positive impact on addressing social and physical disorder in the Redevelopment District. While the ultimate goal of the initiative was to reduce serious crime (through the reduction of disorder), the finding that the Operation had a significant impact on disorder should not be discounted. The positive impact of the project on disorder has important implications for many neighborhoods in the Chandler community, and the reduction of social and physical disorder is justifiable in its own right in that it contributes to establishing a positive and healthy community for all residents.

The Chandler Police Department should be commended for developing a pioneering program that integrated governmental services to address social and physical disorder in deteriorating neighborhoods.

INTRODUCTION

Over the past two decades, police agencies across the nation have been adopting community policing strategies centered on the aggressive enforcement of disorder offenses. These aggressive policing strategies are popularly known as "zero-tolerance," "order-maintenance," and "quality-of-life" policing (Cordner, 1998).[1] These strategies stand apart from other community policing efforts in that they do not attempt to address crime through community cooperation, but rather they attempt to address crime through the aggressive enforcement of disorder (Eck and Maguire, 2000: 21). The origin of quality-of-life policing can be traced back to the broken-windows thesis, first prescribed by Wilson and Kelling in 1982. Wilson and Kelling's (1982) broken windows theory is based on the hypothesis that if social and physical disorder in a community is not attended to more serious forms of disorder, and, eventually, increased levels of crime will follow. For this reason, the authors argued that to combat crime the police must re-orient their focus toward addressing neighborhood disorder.

Despite the relatively large body of literature that has explained, described and expounded upon the broken-windows hypothesis (Kelling and Coles, 1996; Skogan, 1990; Skolnick and Bayley, 1986; 1988; Taylor, 1998; Walker, 1984; Wilson and Kelling, 1982) little research has examined the nature of the organized response to disorder. Much of what we currently know about the police response to disorder comes from the media (Kocieniewski and Cooper, 1998; O'Hara, 1998; Panzarella, 1998) and police executives (Bratton, 1996; 1998). Only a few researchers have examined quality-of-life policing (Dilulio, 1995; Silverman, 1999; Sykes, 1986) and even fewer have examined the

[1] Hereafter, we use the generic phrase "quality-of-life" policing to describe these policing strategies.

effectiveness of the strategy in reducing crime (for exceptions see Novak et al. 1999; Sherman, 1990; Kelling and Coles, 1996).

The purpose of this paper is to examine the impact of quality-of-life policing on crime and disorder. Specifically, we examine a quality-of-life initiative in one jurisdiction that was grounded in an operational strategy of policing social and physical disorder. The study will attempt to advance our understanding of the effects of enforcing order maintenance laws and zoning ordinances on crime and disorder. In the next section we begin by outlining the broken windows hypothesis and the empirical support for the theory. This is followed by a discussion of the implications of the broken windows hypothesis for policing strategies and a review of the research on policing crime and disorder. We then describe the nature and content of the intervention examined in the present study. Last, we present our methodology, findings, and discuss the policy implications of the findings.

THE BROKEN WINDOWS HYPOTHESIS

In the seminal essay, "Broken Windows: The Police and Neighborhood Safety," Wilson and Kelling hypothesized that disorder and crime are "inextricably linked" (1982: 31). They argued that if social disorder (e.g., public drinking, street level drug dealing, prostitution) and physical disorder (e.g., vandalism, neighborhood dilapidation) are left unchecked by the community an environment is created that attracts serious crime. According to the authors disorder signals to those around that crime and delinquency will be tolerated, and will not be subjected to the same amount of scrutiny as might be found in other neighborhoods. Their point is that "minor offenses have serious consequences for the life of neighborhoods and communities" (Kelling and Bratton, 1998: 1219).

Kelling and Coles (1996) further explain that disorder leads to crime in a rather formulaic manner. Visible disorder, they argue, if left uncontrolled, heightens citizens' fear

of crime and leads citizens to believe that a neighborhood is unsafe. After citizens begin to feel unsafe they withdrawal from the community, both physically and psychologically, by reducing their public presence and severing social ties with other residents. The authors maintain that after residents withdraw, detaching themselves from their community, informal social control mechanisms break down. Residents are no longer present to supervise youths or others in the community that are prone to mischief and misbehavior and no longer feel the same sense of mutual responsibility to react to such behavior (Skogan, 1990). As a consequence, more serious forms of disorder begin to materialize, eventually leading to an increase in serious crime. As such, advocates of the broken windows hypothesis argue that it is too late to react to crime problems after serious offenses have taken place (Kelling and Bratton, 1998). Intervention, according to the broken windows hypothesis, must take place at the first sign of disorder to prevent the neighborhood from spiraling deeper into decline (Skogan, 1990).

While there has been a great deal of discussion surrounding the broken windows hypothesis remarkably little research has examined the relationship between disorder, fear and serious crime. One of the few studies to examine this issue was conducted by Skogan (1990) in his attempt to empirically substantiate the broken windows hypothesis. In his analysis, Skogan (1990) primarily relied upon survey data obtained from 13,000 residents in 40 neighborhoods in 6 major cities. The survey questions focused on victimization, perceptions of disorder, fear of crime, and neighborhood satisfaction. Skogan's (1990) analysis provided two major findings. First, perceptions of crime, fear of crime, and victimization were all positively related to neighborhood social and physical disorder. He emphasized that these relationships were stronger than other correlates of crime such as ethnicity, poverty, and residential instability. Second, Skogan (1990) reported that disorder

preceded serious crime in the studied neighborhoods. These two findings taken together have provided much of the empirical support for the broken windows theory and provided justification for police strategies targeted at social and physical disorder.

However, some researchers have begun to question the fundamental notion that disorder and crime are interwoven and temporally linked. Harcourt (1998), for example, re-analyzed Skogan's data and found there was no association between disorder and serious crime. He explained that Skogan's findings are the consequence of data obtained from a few neighborhoods in which the relationship between disorder and crime was particularly strong. However, Eck and Maguire (2000), addressing this debate, point out that had Skogan (1990) removed other neighborhoods from his analysis the relationship between disorder and crime would have been even stronger. Accordingly, Eck and Maguire (2000) in their review of this debate conclude that "Skogan's results are extremely sensitive to outliers and therefore do not provide a sound basis for policy. Rather, they suggest possible relationships that deserve further inquiry" (p. 24).

Despite the lack of consistent research in support of the broken windows hypothesis, Wilson and Kelling's (1982) work sparked a revolution in policing and caused police agencies across the country to rethink the proper role of the police. A number of police executives and researchers argued that the policy implications of broken windows theory were evident and clear—that to reduce crime the police must re-focus their energy and resources and aggressively police social and physical disorder. As a consequence, a number of police agencies across the country began to move toward a role that incorporated quality-of-life concerns.

POLICING CRIME AND DISORDER

Aggressive Policing

Quality-of-life policing, based on the broken windows argument, is founded on the principle that for the police to control crime they must attend to such issues as disorder, minor crime, and the appearances of crime (Cordner, 1998). This strategy is typically characterized by the aggressive enforcement of crime and disorder for the purpose of restoring order to a community and to signal to potential offenders that the police are taking back the streets. Some researchers have pointed out that aggressive policing strategies are one of the few policing strategies that have repeatedly been shown to effectively control crime (Sherman, 1997).

Wilson and Boland (1978) examined the relationship between aggressive policing and crime in 35 large cities. The authors used the number of traffic tickets issued by each police department as a proxy for aggressive policing, arguing that aggressive traffic enforcement is an indicator of the level of police surveillance on city streets. They hypothesized that the more aggressive the police patrolled city streets, the more effective they would be in deterring street crimes such as robbery. The authors reported an inverse relationship between the rate of traffic citations issued per officer and the city's robbery victimization rate. Thus, they conclude that aggressive patrol strategies deter robbery. Sampson and Cohen (1988) replicated the study using a larger sample and slightly altered methodology. The authors combined the number of traffic tickets issued and the number of disorderly conduct arrests per officer to create an aggressive policing component for each police department. Similar to Wilson and Boland, the authors found that police aggressiveness was related to lower robbery rates.

Not all of the research on aggressive policing, however, has indicated that the strategy is effective. Weiss and Freels (1996) examined aggressive traffic enforcement (as a measure of aggressive policing) and its impact on crime in Dayton, Ohio. The authors used a quasi-experimental design with one police district serving as a control area and another police district serving as an experimental area. Patrol officers who worked in the experimental district were told to aggressively enforce traffic laws. Analysis indicated that officers in the experimental district conducted three times as many traffic stops as officers in the control district. While Weiss and Freels found that aggressive policing, as measured through traffic enforcement, led to increases in arrests for offenses related to DUI, drugs, and weapons, it was unrelated to arrests for index crimes.

Others have studied the effectiveness of aggressive policing strategies through the examination of field interrogations. The San Diego Field Interrogation Experiment conducted by Buydstun (as summarized by Sherman, 1992) examined the impact of conducting proactive field stops on suppressible crimes in San Diego, California. The author, using official data obtained from a target and two control areas, reported that the police district that employed the use of aggressive field stops and interrogations had significantly less reported crime than districts that did not use aggressive field stops and interrogations.

Perhaps the most widely acclaimed support for this strategy has come from studies examining aggressive policing directed at specific locations. Sherman (1990) notes that because crime is not randomly distributed, but is typically concentrated in particular locations, the police can more effectively use their resources by directing them to areas where crime is most likely to occur. For example, Sherman et al. (1989) reported that in Minneapolis about five percent of addresses accounted for over half of all calls for service in

the city. As a result, many police agencies over the past twenty years have been adopting aggressive directed patrol strategies aimed at neighborhoods and locations with unusually high levels of crime.[2]

Cordner (1981) examined the impact of aggressive directed patrol on robbery, burglary, auto theft, and theft from vehicles in Pontiac, Michigan. The aggressive directed patrol strategy involved officers actively stopping suspicious persons, engaging in field interrogations, and aggressively stopping vehicles. The officers were to perform aggressive directed patrol during non-committed time. Cordner found that arrests during the intervention period substantially increased and concluded that the strategy was effective in reducing street crime in the targeted areas. However, he also found that the overall level of crime did not decrease in the city and that the drop in crime in the targeted areas may have been displaced to other areas.

In the late 1980s, the National Institute of Justice funded a study aimed at understanding the impact of police presence on crime and disorder in Minneapolis, Minnesota. Researchers from the Crime Control Institute and Rutgers University identified 110 hot spots and then randomly selected 55 of the hot spots to receive increased patrol presence (i.e., more aggressive policing). Using calls for service and observational data, researchers reported that calls for service decreased by 6 to 13 percent and disorder decreased by 50 percent in the targeted areas compared to the control areas (Sherman and Weisburd, 1995). "They also found a relationship between the amount of time that a police officer was present at a hot spot and the length of time that the hot spot was free from crime after the

[2] Over the past five years there has been a burgeoning body of research that has examined the impact of directed patrol on crime. Because space does not permit a thorough review of this literature we only review a subset of the literature that has focused on aggressive directed patrol and do not focus on such issues as the impact of patrol density on crime (Kelling et al, 1974; Police Foundation, 1981) and crime specific policing focusing on special problems such as guns (Sherman and Rogan, 1995), drunk driving (Ross, 1982), and drug markets (Weisburd and Green, 1995; Sherman and Rogan, 1995).

officer left the location" (Sherman, 1997: 15). In particular, the analysis indicated that the longer the officer was present at a location, at least up to a point, the longer the location remained free from crime after the officer left the location (Koper, 1995).[3]

Quality-of-Life Policing

Quality-of-life policing differentiates itself from the above police operational strategies in that it specifically focuses police resources on the aggressive enforcement of social and physical disorder. By aggressively policing social and physical disorder it is believed that community members will be more inclined to care for their neighborhood, which will restore orderliness, and will eventually lead to community members feeling safer and signal to potential criminals that lawbreaking will not be tolerated (Roberts, 1999). While some agencies have adopted quality-of-life policing as part of a department wide policing strategy (Bratton, 1996; Kelling and Bratton, 1998) it is more often employed in specific neighborhoods identified as having serious problems with crime and disorder (Kelling and Coles, 1996).

A few researchers across the country have begun to examine the impact of quality-of-life policing on crime. One of the first studies to investigate the impact of policing disorder on serious crime was conducted by Sherman (1990). Sherman examined an order maintenance crackdown on public drinking and parking violations and its impact on robbery in Washington, DC. As part of the research protocol the police operational strategy included three phases: the first phase included publicizing the nature of the crackdown and the crackdown area; the second phase included a substantial increase in the enforcement of parking violations and liquor offenses; and the third phase was characterized by the police abruptly ending the crackdown. Sherman found that while the order-maintenance crackdown

[3] Koper (1995) reported that patrol presence of 15 minutes generates the longest period of time in which a

had a positive and significant impact on the public's perception of safety, it did not have a significant effect on street robberies.

More recently, Novak et al. (1999) examined the impact of the enforcement of liquor laws (i.e., public drunkenness, minor in possession of alcohol) on robbery and burglary. The aggressive enforcement strategy took place over a thirty-day period in an experimental area, which was later analytically compared to a control area. Using official data for the analysis, the authors reported that the intervention did not have a significant impact on either robbery or burglary. Novak et al. argued that this might have been because the intervention only lasted thirty days, or because the dosage level was not substantial enough to have an impact on serious crime. The authors reported that only 140 arrests and citations were issued during the intervention period.

These two studies taken together suggest that policing disorder may not substantially reduce serious crime as hypothesized by Wilson and Kelling (1982). The lack of empirical support found in the above two studies, however, may be a consequence of the operational strategy used by the police agencies under study. First, both of the above responses were primarily aimed at policing alcohol violations. Their narrow response of policing a specific type of disorder, rather than responding to all forms of disorder, is analogous to repairing every tenth "broken window" and assuming that these few repairs will have a substantial effect on serious crime. It would not be hard to imagine that the same communities that suffer from alcohol-related disorder might also have problems with drug trafficking, prostitution, and homelessness.[4] Addressing one of many problems may not repair the community to a state in which residents feel safer and regain their capacity to control crime.

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location remains crime free, after which time continued police presence exerts less of an effect—or reaches a point of diminishing returns.

[4] Neither of the studies reported the overall environmental climate in which the studies took place so it is difficult to know the amount of disorder that was present in each targeted area.

Second, the above strategies primarily limited their response and evaluation to social disorder. While social disorder involves events and activities, physical disorder persists on a day-to-day basis and often times becomes the dominant characteristic by which a neighborhood comes to be known—both within and outside the neighborhood (Skogan, 1990). While researchers as of yet have failed to untangle the relative importance of social and physical disorder on serious crime (Taylor and Herrel, 2000) researchers have found that they are highly correlated with one another (Skogan, 1990). Like social disorder, physical disorder has been found to be interwoven and temporally linked with serious crime (Schuerman and Kobin, 1986; Taylor and Covington, 1990). As a consequence, the failure of the above programs to respond to and incorporate a strategy to address neighborhood physical disorder may be the reason for the lack of programmatic success.

One of the few studies to examine the impact of policing social and physical disorder on crime was conducted by Kelling--as reported in Kelling and Coles (1996). They explain that in the 1980s the New York City subway was in a state of disrepair. A number of stationhouses

were deteriorated, graffiti covered many walls and trains, and disorderly conduct by youths and homeless persons had become the norm. The New York City Transit Police Department, under the command of William Bratton, and guided by George Kelling, developed an operational strategy based on the broken windows thesis. The strategy involved strictly enforcing disorder laws, ejecting the homeless and loitering youths from the tunnels, and refurbishing trains and station houses. Over the course of the intervention the number of people ejected from the subway tripled and the number of misdemeanor arrests almost quadrupled. Kelling reported that the quality-of-life initiative resulted in a significant reduction in serious crime (Kelling and Coles, 1996).

While Kelling's report provides some support for quality-of-life policing, a number of questions remain. First, while Kelling and Coles (1996) extensively discuss the content of the intervention performed by the New York City Transit Authority, they present little detail with regard to programmatic outcomes other than such qualitative statements as "Consequently, when action was taken against farebeaters, serious crime dropped" (Kelling and Coles, 1996: 134) and

> Disorder and crime are no longer serious problems in New York's subway—it is among the safest in the world. It feels, smells, and 'tastes' different. Indeed, the culture was so different that by the mid-1990s the Transit Authority initiated a civility campaign, encouraging citizens to queue before boarding trains—a campaign that would have been a joke in the late 1980s. Returning ex-New Yorkers are stunned by the changes. (Kelling and Bratton, 1998: 122)

Second, Kelling and Coles themselves question whether their findings should be generalized to neighborhoods and municipal police departments. They point out that subways and stationhouses are qualitatively different environments in which to operate, in that they are spatially bound and have formal entrances and exits. They further explain that the "subway community" is much simpler to police "compared to the complexity of a community [being that] the system is set up to provide a single service; riders pay to use it; and they ride it for relatively short periods of time." (p. 137). Additionally, the authors point out that the transit police are not continually responding to calls for service which permits them more time to aggressively enforce disorder and to solve more complex problems when compared to municipal police officers.

THE PRESENT STUDY

Prior research suggests that while police agencies across the nation are beginning to adopt quality-of-life strategies, there is no consistent evidence that these strategies are effective in controlling crime. The stronger research designs that have been used to test the effectiveness of quality-of-life policing have failed to find support for the strategy. However,

at the same time, these studies appear to have measured the impact of a response that failed to fully and holistically address community disorder (Novak et al., 1999; Sherman, 1990). With the exception of Kelling and Coles (1996) there has been little research that has examined the impact of policing both social and physical disorder on crime. These shortcomings make it difficult to understand the extent to which policing disorder impacts crime.

Using data obtained from the Chandler, Arizona Police Department we examine the department's quality-of-life police initiative aimed at reducing social and physical disorder for the purpose of reducing crime. The study will attempt to advance our understanding of the effects of enforcing order maintenance laws and zoning ordinances on crime and disorder. While this study is not an evaluation of the broken windows hypothesis, it does attempt to evaluate the strategy suggested by Wilson and Kelling (1982) for combating crime.

QUALITY-OF-LIFE POLICING IN CHANDLER, ARIZONA

Project Setting

The present study reports on findings from an evaluation of a community policing initiative conducted in Chandler, Arizona. Chandler is located in the southeast corner of the Phoenix metropolitan area and is bordered by cities such as Phoenix, Mesa, Tempe, Gilbert, and the Gila Indian Reservation. Chandler is the second fastest growing city in the United States with a population of over 170,000 residents. The current estimate is that the city's population is growing by 800 to 900 residents a month. The Chandler Police Department, like the community, has experienced substantial growth, having grown by over 50 percent in the past four years. In 1996, the department employed 193 sworn officers; today, there are 295 full-time sworn officers.

The quality-of-life initiative being evaluated took place in Chandler's Redevelopment District. The Redevelopment District consists of a 4.75 square mile area in the center of the city. As seen in Table One, the Redevelopment District is substantially different from the city in terms of socio-demographic characteristics. In particular, the Redevelopment District contains more Hispanics and younger people compared to the entire city. The Redevelopment District is also economically depressed compared to the city as a whole. For instance, the median household income is about $27,500 in the Redevelopment District compared to about $46,000 for the city; and the median home price in the Redevelopment District is 70 percent of that found in the city ($70,700 compared to $99,000). Households in the Redevelopment District are also about twice as likely to by headed by a female and are almost 1.5 times more likely to be rented rather than owned. Crime in the Redevelopment District is also substantially higher than that found elsewhere in the city. Comparing police calls for service in the Redevelopment District with the rest of the city illustrates the relatively high level of crime and related activity in the Redevelopment District. During the first six months of 1997, the number of calls for service in the Redevelopment District was 2.2 times higher per 1,000 residents in comparison to the rest of the city. During this time period there were 540.9 calls for service per 1,000 residents in the Redevelopment District and 244.4 per 1,000 residents in the rest of the city.

Table 1: 1995 Background Characteristics of the Redevelopment District and the City of Chandler, Arizona*

	Redevelopment District	City of Chandler
Population	21,596	132,369
# of Housing Units	6,871	49,099
Median Household Income	$27,597	$46,096
Ethnic Characteristics		
White	42.7	67.8
Hispanic	51.0	17.3
African American	2.8	2.6
Asian	1.8	2.4
Native American	1.7	1.2
Other	0.5	8.7
Population Age		
> 5	10.8	9.4
5-13	17.7	16.2
14-17	6.2	5.6
18-21	6.2	4.3
22-54	45.7	54.0
55-59	3.0	2.9
60-74	7.3	5.6
+ 75	3.1	2.0
% Female Headed Household	23.2	11.0
Median Home Price	$70,700	$99,000
% Own Home	54.8	72.5
% Rent	45.2	27.5

* Data is based on the 1995 Special Census. It was obtained from the City of Chandler Economic Development Office.

Operation Restoration

In November 1995, the Chandler City Council established a Neighborhood Task Force that was charged with identifying quality-of-life problems in the city. After surveying residents, holding community meetings, and meeting with key community stakeholders the Neighborhood Task Force concluded that the most influential problem affecting the quality-of-life of residents in the City of Chandler was the increase in physical deterioration and social disorder in the city's aging neighborhoods. Residents complained of a high level of street level drug trafficking, prostitution, and bootleg liquor sales. Community residents and leaders also complained that the older sections of the community were in a constant state of

disrepair. They explained that many of the homes had broken or missing windows, doors falling off their hinges, and significant amounts of trash and debris cluttering the property (Building Stronger Neighborhoods, 1996; Chandler Police Department, 1997).

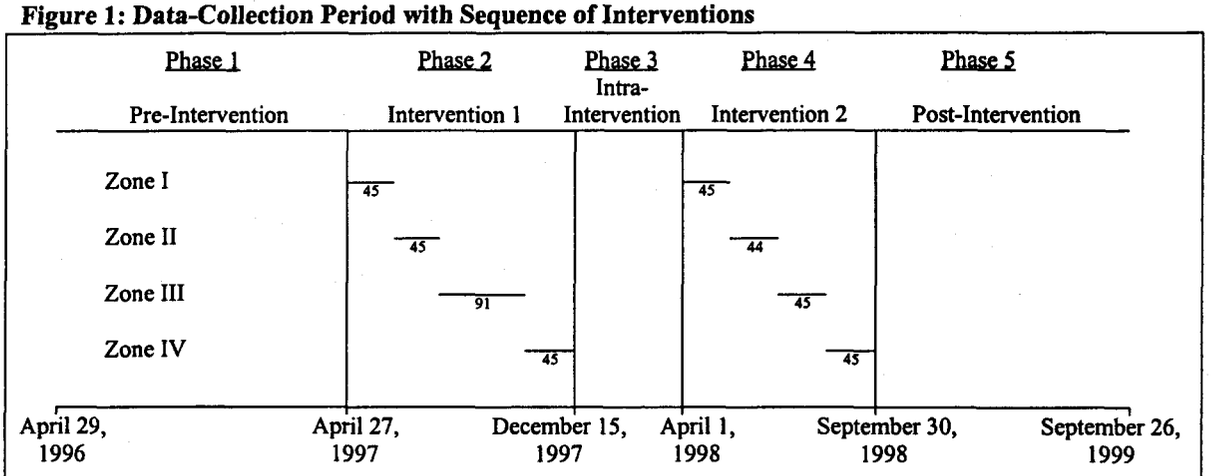
The city first responded by transferring its zoning enforcement responsibilities to the police department from the Planning and Development Department in early 1997. This unit, hereafter called the Neighborhood Service Unit, was staffed with seven civilians: four inspectors, two graffiti painters, and one supervisor. The unit was responsible for enforcing city code violations pertaining to weeds, debris, inoperable vehicles, and graffiti abatement. The unit also conducted a seven point "house check" on private residences to ensure that properties met city-zoning standards. At approximately the same time the police department received federal funds from the Community Oriented Policing Services office to develop a Neighborhood Response Team. The team consisted of six sworn officers and one sergeant. The officers patrolled neighborhoods on bicycles conducting field interviews, traffic stops, and aggressively enforcing all municipal codes and county laws. The officers were also responsible for attending bi-monthly beat meetings (attended by beat detectives, beat patrol officers, and community members) for the purpose of identifying and responding to neighborhood problems.

In April 1997, the Neighborhood Services Unit and the Neighborhood Response Team were organizationally integrated for the purpose of focusing their resources on quality-of-life and crime issues in the Redevelopment District of the city. The Chief of Police, at the recommendation of the Neighborhood Task Force, selected the city's Redevelopment District for the special operation because it comprised some of the oldest neighborhoods in the city. The Task Force determined that it was the area of the city where physical deterioration was

the worst and had historically generated the most calls for police services (Chandler Police Department, 1997).[5] This special operation came to be known as "Operation Restoration."

To enable the two units to focus their resources on smaller areas the Redevelopment District was geographically divided into four zones ranging in size from 1 to 1.5 square miles. Both units focused on a single zone for 45 days and then moved to the next zone.[6] Once the two units completed working in all four zones they waited approximately three months before repeating the process (see Figure 1). Thus, the units operated in each zone twice. At the beginning of the operation in each zone a community meeting was held with zone residents to allow police officials to educate attendees about the nature of the operation and ask them to pass the information to others in the neighborhood. Police officials also used the meetings as a forum for residents to express their concerns about quality-of-life issues in their neighborhood and to give residents an opportunity to ask any questions or convey any concerns related to the operation.

Figure 1: Data-Collection Period with Sequence of Interventions



NOTE: Lines indicate the period of the interventions in each zone. The numbers below the lines represent the duration of the intervention in the particular zone.

[5] Interviews with police officers indicated that the city's problems with prostitution and street level drug trafficking were primarily restricted to this neighborhood.

At the beginning of the operation in each zone, Neighborhood Service Specialists inspected all private and business properties. Inspectors cited property owners for such violations as weeds on developed areas, vehicles parked on unimproved surfaces, abandoned or inoperable vehicles, litter, trash, or outdoor storage, and unsecured or dirty swimming pools. It was not unusual to cite property owners with failure to properly maintain their property (i.e., needing to paint their house) or possessing farm stock within city limits without a license (i.e., raising chickens and goats for personal consumption). Upon being served with a violation notice owners had 20 days to bring their property into compliance. After 21 days Neighborhood Service Specialists would re-inspect the property and if the property had not been brought into compliance issue a citation.[7]

Neighborhood Response Team officers used both unmarked vehicles and bicycles to patrol zones. Unmarked vehicles were used for the surveillance of street level drug trafficking, prostitution, gang activity, and suspicious persons. Bicycles were used to conduct field interrogations, issue summonses for traffic offenses and to aggressively enforce disorder crimes. Bike patrol was also used to increase the officers' accessibility to neighborhood residents. To increase officer awareness of neighborhood problems special emphasis was placed on making contact with business owners and residents. Neighborhood Response Team officers were not dispatched to calls for service so they were free to aggressively police crime and disorder in the target area.

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[6] The treatment protocol was deviated once during the first round of enforcement efforts when Zone Three received 91 days of treatment, instead of the proscribed 45 days and once in the second round when Zone Two received 44 days instead of the proscribed 45 days.

[7] Extensions were permitted for owners that needed additional time to complete lengthy projects. Additionally, cases in which individuals could not bring their property under compliance, for physical or financial reasons, were forwarded to a volunteer project coordinator or a city outreach program for assistance.

Treatment Content and Dosage

The activity that took place during Operation Restoration consisted of a change in the content of police services and an increase in the amount (or dosage level) of police services in each targeted zone. Officers who were typically assigned to the target area continued their work as normal. Because the officers assigned to the Neighborhood Response Team were not assigned calls for service they represented a substantial increase in the amount of patrol presence and proactive police activity in targeted zones. The civilians assigned to the Neighborhood Services Unit were also restricted from working in neighborhoods outside of the targeted zone, except in cases where they were required to re-inspect property that had previously been cited with a zoning violation. Their efforts resulted in a substantial increase in code enforcement efforts by the police department. Because the specialists wore uniforms and drove vehicles that identified them as employees of the Chandler Police Department they appear to have increased the amount of police departmental presence, though this cannot be stated for certain.[8]

Table Two shows that the activity generated by the Neighborhood Response Team during Operation Restoration resulted in a considerable amount of contact with the public. Specifically, it shows that the officers conducted 630 arrests, issued 1,049 citations, and made 3,235 field activity contacts over the course of the operation. The Neighborhood Service Unit initiated 3,270 cases in the four zones. Review of the re-inspection data revealed that over 97 percent of those cited with a violation voluntarily complied with the request to make property improvements. The remaining 82 cases (2.5%) were resolved

[8] Police commanders, police officers, members of the Neighborhood Service Unit and civilians all agreed that the presence of the Neighborhood Service Unit increased the department's capacity to identify criminal activity and increased citizen awareness of the presence of the police department. This was re-affirmed through complaints lodged against the police department, by citizens complaining that they were "confused" by the Neighborhood Service Unit's uniforms and that they mistook specialists for sworn police officers.

through citations to appear in City Court. This suggests that the physical condition of the Redevelopment District was significantly improved over the course of the operation.

Table 2: Intervention Activities that took place during Operation Restoration

	Neighborhood Services Unit				Neighborhood Response Team			
	Cases Initiated[1]	Cases Complied	Graffiti Abated	Total Improvements[2]	Arrests[3]	Citations[4]	Field Activity[5]	Total Police Contacts[6]
Zone I								
Intervention 1	281	248	67	315	89	171	358	618
Intervention 2	214	214	42	256	81	197	518	796
Zone II								
Intervention 1	281	256	62	318	54	117	384	555
Intervention 2	131	131	25	156	38	115	316	469
Zone III								
Intervention 1	1,198	1,189	229	1,418	123	104	310	537
Intervention 2	309	304	72	376	78	51	174	303
Zone IV								
Intervention 1	611	601	90	691	101	74	188	363
Intervention 2	245	245	21	266	66	220	987	1,273
Entire Redevelopment District	3,270	3,188	608	3,796	630	1,049	3,235	4,914

[1] Cases were initiated for the following reasons: parking on unimproved surfaces, weeds, litter, trash, debris, outside storage, inoperable vehicles, fences, pets, keeping of roosters, commercials, and graffiti.
[2] Total improvements equals number of cases complied plus amount of graffiti abated.
[3] Arrests included felonies, misdemeanors, juvenile referrals, and warrants.
[4] Citations were made for civil, curfew, liquor, traffic, and city violations.
[5] Field activity consisted of GIMIC cards, field interviews, service requests, night eyes, and bicycle registrations.
[6] Total police contacts equals arrests plus citations plus field activity.

DATA

We examine the impact of the intervention on crime and disorder using calls for service (CFS) data obtained from the Chandler Police Department's crime analysis unit. Traditionally, efforts to measure crime and disorder by place have been restricted to police crime reports. However, a number of researchers have argued that official crime data are inappropriate for such studies (Mazerolle et al., 2000; Sherman et al., 1989; Sherman and Weisburd, 1995; Skogan, 1990; Weisburd and Green, 1995). Two major reasons have been noted. First, official police records substantially underreport, and perhaps distort, disorder problems. Police scholars maintain this is largely because police officers are more likely to handle such incidents informally (Sherman, 1986; Skogan, 1990). For example, Black (1980), in his observational study of police officers in Boston, Chicago, and Washington, DC, found that only about 40 percent of minor complaints are officially recorded (See also Sherman, 1986). The second weakness of official crime data is that the mean number of official offenses recorded in an intervention area is typically too low to generate a sufficient amount of statistical power.[9] Therefore, the probability of finding a significant effect is decreased (Mazerolle et al., 2000; Sherman and Weisburd, 1995; Weisburd and Green, 1995).

CFS data have been recognized by many police scholars as a more reliable indicator of change in crime and disorder, particularly when examining place-based police interventions (Mazerolle et al., 2000; Sherman et al, 1989; Sherman and Weisburd, 1995; Weisburd and Green, 1995). This is largely because CFS are not as susceptible to the discretionary behavior of individual police officers (Sherman et al., 1989; Warner and Pierce,

[9] For example, Novak et al. (1999) in their study of the aggressive policing of disorder on serious crime concluded that their findings may have been influenced by the fact that the official data that they used did not contain enough variability, and, therefore, their likelihood of finding a relationship between the two was limited.

1993). In this regard Sherman et al. (1989: 36) argued that, "Calls to the police provide the most extensive and faithful account of what the public tells the police about crime."[10] Accordingly, we use CFS data to examine the impact of the quality-of-life operation. The CFS data were collected from April 29, 1996 through September 26, 1999 for a total of 1,245 days. This includes data for a period of 363 days prior to the first intervention and 361 days following the last intervention.

ANALYTIC STRATEGY

The unit of analysis in the present study is the daily number of CFS in the Redevelopment District and within each zone.[11] The dependent variables in our analyses are the number of CFS for ten offense categories. In particular, calls were assigned to one of the following ten categories: (1) person crime (2) property crime, (3) drug crime, (4) suspicious persons, (5) assistance, (6) public morals, (7) physical disorder, (8) nuisance, (9) disorderly conduct, and (10) traffic. All other types of CFS were removed from the data set (*i.e.*, 911 hang-ups). The final data set included a total of 47,270 CFS in the Redevelopment District over the 1,245 day period. Because each of the four zones received interventions at different points in time we also examine each zone separately, allowing us to more precisely model changes in disorder and crime.[12] This resulted in 50 sets of time series data, each spanning a total of 1,245 days.

We use two types of analyses to assess the impact of the intervention on crime and disorder in the targeted areas. Our first set of analyses compares changes in the dependent variables before and after the interventions using *t*-tests to compare means. In particular, we

[10] See Klinger and Bridges (1997) for a thorough discussion of the limitations of CFS data.
[11] The data set includes both emergency and non-emergency calls for service.
[12] Because the intervention focuses on different zones in the Redevelopment District at different times we might not capture temporary or gradual intervention effects. For example, the intervention in Zone 1 took place almost 6-months prior to the intervention in Zone 4, by which time any intervention effects in Zone 1 may have dissipated. Accordingly, we believed that it was also necessary to model the impact of the intervention by zone.

compare (1) the pre-intervention period to the intra-intervention period (i.e., the period following the first intervention but before the second intervention); (2) the pre-intervention period to the post-intervention period; and (3) the intra-intervention period to the post-intervention period. We use these analyses to examine the impact of the intervention in both the Redevelopment District and within each zone.

Means tests are not always the most appropriate analytical technique when examining time series data. If a time series is autocorrelated or contains a drift or trend the standard errors used in a *t*-test will be biased, leading to biased *t*-values and possible Type I error (Abraham, 1987; McDowall, 1980). Since many of our time series were found to be autocorrelated we utilize the procedure outlined by Box and Jenkins (1975) and construct a series of ARIMA models. The interrupted time series approach also permits us to examine several different "impact patterns" that might not otherwise be observed. In particular, in addition to testing for an abrupt and permanent change in CFS we can test for (1) a gradual and permanent change in CFS and (2) an abrupt and temporary change in CFS.

We built each model using the three step model-building strategy outlined by McDowall et al. (1980). First, we identified each series empirically by examining graphs of the raw data for the 363-day pre-intervention period (the autocorrelation functions (ACF), and the partial autocorrelation functions (PACF)). With the exception of the nuisance category, the analyses revealed that our series were stationary in both variance and level and suggested that they were not in need of differencing (McCleary and Hay, 1980; McDowall et al., 1980). The nuisance series displayed a clear weekly pattern and was thus differenced with a lag of seven. Second, we checked each tentative model to see if the parameter estimates fell within the bounds of stationarity/invertibility and whether they were statistically significant. We identified autoregressive and/or moving average components for

27 of the 50 time-series examined. Third, we diagnosed model residuals to ensure that they were not different from white noise as indicated in ACFs and PACFs of the residuals and a Ljung-Box statistic. Once the univariate ARIMA models were satisfactorily identified we tested for the impact of the interventions. For each offense category, in each targeted area, we estimated three models to test for three types of effect – abrupt/temporary, abrupt/permanent, and gradual/permanent.[13] We then compared intervention parameter estimates across models to ascertain the best fitting model (i.e., out of range or insignificant intervention coefficients indicated a poor fitting model).

The greatest weakness of our analytic strategy is the possibility that something other than the intervention could have caused the level of CFS to change – what is referred to as *history* (Campbell & Stanley, 1963; Cook & Campbell, 1979). While ARIMA models can control for trend or drift over time they do not necessarily eliminate the effects of external factors. Because the Redevelopment District is distinctly different from other neighborhoods in Chandler, Arizona in terms of the nature and extent of social disorder, physical decay, and crime, we were not able to utilize a typical experimental and control group design. Nevertheless, the intervention design corresponds with what Cook and Campbell refer to as an *interrupted time series with multiple and switching replications*. The advantage of this design is its ability to control for most threats to internal validity. As Campbell and Stanley state, "the more numerous and independent the ways in which the experimental effect is demonstrated, the less numerous and less plausible any singular rival invalidating hypothesis becomes. The appeal is to parsimony" (p. 36). Thus, if the intervention had an impact in all four zones (at four different points in time) across two years then it is likely the effect is due to the intervention rather than some other, unknown event.

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[13] Many of the gradual/permanent models failed to converge initially and required the loosening of the

Accounting for Spatial Displacement and Diffusion of Benefit Effects

As of late, a number of researchers have strongly argued for the importance of examining possible displacement and diffusion effects resulting from police interventions.[14] In the current study, we focus specifically on spatial displacement and the related issue of diffusion of benefits.[15] Examining spatial displacement consists of measuring the extent to which crime moves from one location to another. Researchers have hypothesized that blocking opportunities in one place simply results in crime being displaced to a near-by place where opportunities are not blocked (Barr and Pease, 1990; Gabor, 1978; Green, 1995; Hakim and Rengert 1981; Reppetto, 1976; Weisburd and Green, 1995). The theoretical underpinnings of this hypothesis are based on the rational choice and opportunities literature (Clark, 2000).

A number of studies have empirically documented displacement effects. For example, Press (1971) reported that a crackdown on crime in one police district in New York City led to increased crime in surrounding districts. Chaiken et al. (1974) found that crime prevention strategies aimed at reducing bus robberies in New York City led to increased robberies in the subway. Additionally, Caulkins and Rich (1991) discovered that a drug market crackdown in one neighborhood in Hartford resulted in the drug market moving to a nearby neighborhood. However, other research has suggested that police led interventions can reduce crime without increasing crime in a contiguous area. Matthews (1990), for example, reported that a successful police led crackdown on prostitution in a red light district in England did not lead to increased prostitution in other locations. Similarly, Sherman and

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convergence criteria (from .001 to .005 or .01) in order to estimate them.

[14] For a thorough review of the displacement and diffusion of benefits literature see Barr and Pease (1990) and Clark (2000).

[15] The literature suggests that there are five types of displacement: temporal, spatial, tactical, target, and crime type (Hakim and Rengert, 1981). However, we restrict our analysis in the present study to spatial displacement because we do not have data that would allow us to test for the other four types.

Rogan (1995) examined the effects of gun seizures on violent crime in Kansas City. They reported that the intervention led to gun crimes decreasing by almost 50 percent in the targeted area, with no increase in gun crime in the surrounding districts.

As of recent, some research has shown that areas contiguous to intervention areas even experience a decrease in crime. Such findings have led some researchers to suggest that there may be a "diffusion of benefits" in which areas that surround treatment areas, but do not actually receive any treatment, receive residual benefits from interventions (Green, 1995; Weisburd and Green, 1995). Clarke and Weisburd (1994) describe two forms of diffusion. First, they argue that diffusion of benefits can be invoked through deterrence, whereby would-be offenders notice an increased level of enforcement, which they perceive to increase their risk of apprehension. Second, the authors maintain that diffusion of benefits can be achieved through discouragement. Here, potential offenders weigh the amount of effort required to commit the crime--the greater the effort, the less likely offenders are to commit the crime. Green (1995) examined the diffusion of benefits hypothesis in her study of drug hot spots in Oakland. She reported that municipal codes and drug nuisance abatement laws were effective in reducing drug problems in the targeted areas and resulted in a diffusion of benefits to adjoining areas. She argued that this may have been the consequence of the program "discouraging drug buyers and sellers, and decreasing the total number of persons involved in drug activity" (p.752).

Therefore, in addition to assessing the impact of the intervention in the targeted areas we examine changes in crime and disorder in the areas immediately adjoining the targeted areas. We use two analytic strategies in attempting to identify displacement and diffusion of benefit effects. First, we look for changes in crime and disorder by examining the ¼ mile boundary area

(approximately 4 city blocks) around the Redevelopment District.[16] We then test for mean changes in crime and disorder using CFS in the contiguous area – first with *t*-tests and then with ARIMA models.[17]

Second, we create a ¼ mile boundary around each zone and look for changes in crime and disorder within these areas. This analysis is necessarily limited due to the proximity of each of the intervention areas. In particular, because each zone borders the other zones we encounter a methodological problem of overlapping catchment areas (part of each zone's catchment area either just received the intervention and/or will receive the intervention next). To minimize this contamination we limit our analysis of the areas adjoining the targeted zones to the 363-day pre-intervention period (the period before the project started), the 45-day period when the zone received the treatment, the 106-day intra-intervention period (the period when none of the zones received treatment), and the post-intervention period (the period after the intervention had been completed in all four of the zones). Thus, with the exception of the periods in which the zone was receiving treatment the same data points were used for examining each zone's contiguous area. In this manner we identified any immediate spatial displacement or diffusion of benefits.

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[16] Novak et al. (1999) point out that the size of the area to examine for displacement effects appears to be a relatively arbitrary decision. For example, Green (1995) and Weisburd and Green (1995) used a two-block catchment area. This largely appears to be because they were examining the impact of crackdowns on hotspots, which are generally fairly small areas. Novak et al. (1999), on the other hand, explained that they used a three to four block catchment area because their target area was larger than that of Green's (1995) and Weisburd and Green's (1995) hotspots. While our decision to examine four city blocks for displacement was determined in part out of necessity (our data are broken down into quarter mile grids), it appears to be of reasonable size based on the literature.

[17] It is possible for displacement or diffusion effects to take a gradual/permanent form. Thus, we also ran a series of models that included a first order transfer function for each intervention. These models did not produce any significant sets of intervention coefficients and thus are not included here.

RESULTS

Difference of Means

Table 3 presents the mean number of CFS for each offense type in the Redevelopment District and in each of the four zones during the pre-intervention, first intervention, intra-intervention, second intervention, and post-intervention periods. The table indicates significant changes in the number of CFS from the pre-intervention to the post-intervention period in the Redevelopment District for public moral offenses, physical disorder, and nuisance offenses. In particular, the number of CFS for public moral offenses declined significantly from .46 calls per day to .30 calls per day (or, on an annualized basis, the number of CFS for public moral offenses declined from 168 to about 110). On the other hand, the number of CFS for physical disorder significantly increased from .86 calls per day to 1.10 calls per day (for an annual change of 314 to 402 CFS) and the number of CFS for nuisances significantly increased from 3.88 calls per day to 4.38 calls per day (for an annual change of 1,416 to 1,598 CFS).

The examination of changes in mean daily CFS by zone reveals somewhat mixed findings. When comparing pre-intervention to post-intervention periods, CFS for crimes against persons and suspicious persons decreased significantly in two zones but increased significantly in one zone. Likewise, property crime offenses decreased significantly in three zones and increased significantly in one zone. The analysis revealed that the significant increases in CFS for persons, property, nuisance, and suspicious person's categories were restricted to zone four. Calls for assistance increased significantly in two zones, but did not change significantly in the two other zones. There was no clear pattern of change in CFS for the disorderly conduct and traffic offense categories. Finally, CFS for drug-related offenses only changed significantly in one zone during the study periods.

The most consistent findings across the four zones were found in the public morals and physical disorder categories. CFS for public morals decreased significantly from the pre-intervention to the intra-intervention period in three of the four zones, however only two zones maintained that decrease in the post-intervention period. The opposite trend was observed for the physical disorder category, where CFS increased significantly in all four zones between the pre-intervention period and the intra-intervention period. Like the public morals category, changes in levels of physical disorder CFS remained stable in the post-intervention period in only two zones with one zone returning to its pre-intervention level.

Table 3: Mean Daily CFS in the Redevelopment District and in each of the Four Zones by Crime Type

Type of CFS	Entire Redevelopment District	Zone I	Zone II	Zone III	Zone IV
Person					
Pre-Intervention	6.83	1.52	1.47	1.99	1.85
Intervention 1	6.63	1.18	1.09	2.04	1.82
Intra-Intervention	6.27	1.54	1.43	1.81	1.87
Intervention 2	6.74	1.47	1.30	1.40	2.02
Post-Intervention	6.53	1.49	1.28[A]	1.72[A]	2.06[A,B]
Property					
Pre-Intervention	10.65	2.25	2.13	3.74	2.58
Intervention 1	10.92	1.76	2.11	3.96	2.69
Intra-Intervention	10.68	2.34	2.15	3.73	2.78
Intervention 2	11.08	2.20	1.45	3.64	3.22
Post-Intervention	10.22	2.01[A,B]	1.91[A,B]	3.44[A]	3.14[A]
Drug					
Pre-Intervention	.80	.20	.21	.21	.15
Intervention 1	.79	.13	.18	.22	.24
Intra-Intervention	.64	.17	.19	.29	.14
Intervention 2	.59	.16	.05	.09	.24
Post-Intervention	.77	.16	.18	.18[B]	.17
Suspicious Person					
Pre-Intervention	3.89	.91	.77	1.41	.88
Intervention 1	3.72	.71	.62	1.15	1.04
Intra-Intervention	3.88	.80	.67	1.40	1.08[A]
Intervention 2	3.90	.76	.68	1.44	.87
Post-Intervention	3.62	.69[A]	.59[A]	1.28	1.07[A]
Assistance					
Pre-Intervention	1.03	.24	.28	.30	.22
Intervention 1	.99	.24	.33	.31	.27
Intra-Intervention	.97	.22	.23	.24	.26
Intervention 2	1.15	.27	.41	.18	.18
Post-Intervention	1.07	.31[A,B]	.23	.26	.30[A]
Public Morals					
Pre-Intervention	.46	.12	.13	.12	.07
Intervention 1	.34	.13	.09	.12	.07
Intra-Intervention	.17[A]	.05[A]	.06[A]	.09	.02[A]
Intervention 2	.37	.09	.09	.13	.13
Post-Intervention	.30[A,B]	.07[A]	.10	.08[A]	.07[B]
Physical Disorder					
Pre-Intervention	.86	.15	.09	.33	.29
Intervention 1	1.04	.18	.16	.49	.09
Intra-Intervention	1.57[A]	.26[A]	.16[A]	.50[A]	.50[A]
Intervention 2	1.36	.38	.18	.56	.24
Post-Intervention	1.10[A,B]	.25[A]	.09[B]	.42	.37[A]
Nuisance					
Pre-Intervention	3.88	.91	.73	.99	1.26
Intervention 1	3.89	.78	.69	1.11	1.60
Intra-Intervention	4.15	.73[A]	.75	1.21[A]	1.48
Intervention 2	3.80	1.13	.70	.87	1.22
Post-Intervention	4.38[A]	.87	.77	1.03	1.52[A]
Disorderly Conduct					
Pre-Intervention	3.43	.91	.77	.96	.91
Intervention 1	3.77	1.11	.91	1.11	.98
Intra-Intervention	3.17	.85	.63[A]	.90	.94
Intervention 2	3.37	1.00	.43	.89	.87
Post-Intervention	3.28	.77[A]	.69	.93	.93
Traffic					
Pre-Intervention	4.14	.85	.64	1.54	1.00
Intervention 1	3.85	1.11	.82	1.55	1.07
Intra-Intervention	4.02	.69[A]	.70	1.68	.85[A]
Intervention 2	3.78	.67	.52	1.27	1.18
Post-Intervention	3.89	.66[A]	.60	1.49	1.16[A,B]

[A] $p < .05$ (t-test comparison to Pre-Intervention period), [B] $p < .05$ (t-test comparison to Intra-Intervention period)

Interrupted Time Series Analysis

Table 4 presents a summary of the impact of the quality-of-life initiative on each offense type in the Redevelopment District and in each of the four zones (see Appendix 1, 2, and 3 for parameter estimates). It displays the direction of the effect and the type of intervention that best fit the data (i.e., abrupt/permanent, gradual/permanent, or abrupt/temporary).[18] It should be noted that none of the interventions had a gradual effect—all significant effects were abrupt. The table shows that the quality-of-life program had different effects on different categories of crime and that the impact of the program varied by zone

[18] The appropriate intervention form was determined by examining the omega and delta coefficients. In first-order transfer functions applied to a pulse series, the delta coefficient cannot be negative and cannot be greater than one (even values close to one indicate the system may be unstable). Additionally, for the intervention to be considered significant the omega parameter must be significantly different from zero. In first-order transfer functions applied to a step series, both the omega and delta coefficients must be significantly different from zero to conclude that the intervention had an effect. Once again, the delta coefficient must lie between zero and positive one. Note, for one offense type both an abrupt temporary and an abrupt permanent intervention component fit the model. This indicates an immediate effect that dissipated and a longer-term change in the mean level of CFS.

Table 4: Summary of Time Series for the Redevelopment District and each Zone by Crime Type – Best Fitting ARIMA Model

Type of Crime	Entire Redevelopment District	Zone I	Zone II	Zone III	Zone IV
Person					
Intervention 1					-
Intervention 2				-	+
Form of Effect				A,P	A,T A,P
Property					
Intervention 1					+
Intervention 2		-			+
Form of Effect		A,P			A,T A,P
Drug					
Intervention 1				+ +	
Intervention 2	+				+
Form of Effect	A,T			A,T A,P	A,T
Suspicious Person					
Intervention 1					+
Intervention 2		-	-		+
Form of Effect		A,P	A,P		A,P
Assistance					
Intervention 1					
Intervention 2		+			+
Form of Effect		A,P			A,P
Public Morals					
Intervention 1	-	-	-		-
Intervention 2	-	-		-	+
Form of Effect	A,P	A,P	A,P	A,P	A,P
Physical Disorder					
Intervention 1	+	+	+	+ +	+
Intervention 2	+	+	-		
Form of Effect	A,P	A,P	A,P	A,T A,P	A,P
Nuisance					
Intervention 1	-	-			-
Intervention 2		+			
Form of Effect	A,T	A,T			A,T
Disorderly Conduct					
Intervention 1			-	+	
Intervention 2	+	+ -		+	+
Form of Effect	A,T	A,T A,P	A,P	A,T	A,T
Traffic					
Intervention 1		-			
Intervention 2		-			+
Form of Effect		A,P			A,P

Significant effects ($p<.05$) are described as "A,P" "G,P" and A,T. The "+" and "– " indicate the direction of the effect as compared to the pre-intervention period.

A,P Abrupt, Permanent

G,P Gradual, Permanent

A,T Abrupt, Temporary

Table 4 reveals that several significant changes took place after the implementation of Operation Restoration in the Redevelopment District. The CFS data indicate a permanent decrease compared to the pre-intervention period in the number of public moral calls after both the first and second intervention periods. The findings also depict a temporary decrease in the number of nuisance calls after the first intervention. The time series analysis revealed that the intervention had a significant impact on the number of CFS for drugs and disorderly conduct, with both increasing temporarily. The analyses indicated that when compared to the pre-intervention period the number of calls for physical disorder increased permanently in both the intra-intervention period and the post-intervention period.

The time series analysis presented in Table 4 also suggests that the impact of the intervention varied by zone. Table 4 shows that the intervention resulted in a temporary decline in the number of crimes against persons calls in one of the four zones during the intra-intervention period. In addition, crimes against persons calls decreased permanently in one zone and increased permanently in another zone after the second intervention. There was a permanent increase in CFS for assistance during the post-intervention period in two zones. For property crimes, one zone experienced a temporary increase after first intervention, another zone experienced a permanent increase after the second intervention, and still another zone experienced a permanent decrease after the second intervention. Calls for drug offenses were found to permanently increase in one zone during the intra-intervention period, and found to temporarily increase in another zone during the post-intervention period. Calls to the police about suspicious persons permanently increased during the intra-intervention period and during the post-intervention period in zone four. Suspicious person calls also decreased permanently in two zones during the post-intervention

period. For nuisance calls, there was a temporary decrease in one zone during the intra-intervention period and in another zone there was a decrease in nuisance calls during the intra-intervention period followed by a significant increase during the post-intervention period. Finally, traffic CFS permanently decreased in both periods in zone one, while an increase was noted in zone four only in the post-intervention period.

The most consistent findings by zone were for the public morals, physical disorder, and disorderly conduct offense categories. The data revealed that the intervention had a permanent impact on public morals calls during both the intra-intervention period and the post-intervention. In particular, we found that calls for public morals declined during the intra-intervention period in three of the four zones and permanently declined in two of the four zones during the post-intervention period. The intervention also had a permanent impact on calls for physical disorder. During the intra-intervention period calls for physical disorder significantly increased in all four of the zones. However, the increase dissipated in all zones but one by the post-intervention period, with one zone even experiencing a decrease. The time series for the disorderly conduct offense category showed that in three of the four zones the intervention resulted in a temporary increase in CFS during the post-intervention period. Interestingly though, in zone one the temporary increase was accompanied by a permanent decrease. The analysis also showed that in one zone disorderly conduct calls temporarily increased during the intra-intervention period and in another zone they permanently decreased.

Displacement and Diffusion Effects

An examination of changes in CFS in the contiguous areas surrounding the treatment areas suggests that there may have been some displacement. In particular, Table 5 suggests that the mean number of CFS related to traffic increased significantly outside one zone and

the whole Redevelopment District after the first intervention and outside of two of the zones and the Redevelopment District after the second intervention. This finding is confirmed through the interrupted time series analysis, which shows that traffic calls increased significantly in the area outside of the Redevelopment District between the pre-intervention period and intra-intervention period and between the pre-intervention period and the post-intervention period. It also shows that CFS for traffic offenses increased significantly in the area outside of the Redevelopment District during the second intervention period (see Table 6). Additionally, Tables 5 and 6 show that calls for drug related offenses and calls for assistance increased significantly after the second intervention period in the area just outside of the Redevelopment District (see Appendix 4 for parameter estimates).

Table 5: Mean Daily Calls for Service in the Areas Contiguous to the Redevelopment District and Each Zone (Displacement and Diffusion Effects)

Type of CFS	Redevelopment District	Zone I	Zone II	Zone III	Zone IV
Person					
Pre-Intervention	.92	2.04	1.12	1.44	1.87
Intervention 1	.87	1.87	1.18	1.44	1.71
Intra-Intervention	.90	1.72	1.05	1.41	1.83
Intervention 2	1.06	2.07	1.14	1.13	1.84
Post-Intervention	.89	1.96	1.13	1.35	1.62[A]
Property					
Pre-Intervention	2.39	2.82	1.97	2.99	3.10
Intervention 1	2.58	2.87	1.76	3.32	3.49
Intra-Intervention	2.16	2.86	2.28	3.11	3.32
Intervention 2	2.30	2.84	2.14	3.24	3.11
Post-Intervention	2.36	2.91	1.64[A,B]	2.99	2.73[A,B]
Drug					
Pre-Intervention	.09	.28	.13	.13	.21
Intervention 1	.08	.31	.13	.09	.36
Intra-Intervention	.07	.20	.16	.08	.18
Intervention 2	.11	.16[A]	.18	.13	.18
Post-Intervention	.16[A,B]	.27	.17	.18[B]	.24
Suspicious Person					
Pre-Intervention	1.01	.94	.66	.99	1.03
Intervention 1	1.18	.98	.64	.99	.76
Intra-Intervention	.96	1.00	.60	.98	.95
Intervention 2	.86	1.07	.66	1.02	.84
Post-Intervention	1.04	.92	.63	1.01	1.08
Assistance					
Pre-Intervention	.18	.33	.26	.30	.27
Intervention 1	.22	.24	.22	.25	.24
Intra-Intervention	.21	.38	.17	.18[A]	.25
Intervention 2	.26	.42	.39	.27	.60[A,B]
Post-Intervention	.27[A]	.33	.28[B]	.39[B]	.29
Public Morals					
Pre-Intervention	.07	.18	.08	.11	.15
Intervention 1	.07	.13	.09	.04[A]	.07
Intra-Intervention	.03[A]	.05[A]	.05	.01[A]	.08[A]
Intervention 2	.07	.07[A]	.02[A]	.11	.18
Post-Intervention	.05	.12[A,B]	.06	.08[B]	.10
Physical Disorder					
Pre-Intervention	.16	.22	.18	.19	.17
Intervention 1	.30[A]	.29	.31	.29	.18
Intra-Intervention	.57[A]	.46[A]	.34[A]	.45[A]	.58[A]
Intervention 2	.27[A,B]	.31	.41[A]	.38	.24[B]
Post-Intervention	.30[A,B]	.28[B]	.17[B]	.24[B]	.23[B]
Nuisance					
Pre-Intervention	.74	1.14	.46	.88	.92
Intervention 1	.66	.87	.42	.77	1.04
Intra-Intervention	.58	.97	.48	.87	.77
Intervention 2	.63	1.51[B]	.50	.58	.71
Post-Intervention	.84[B]	1.33[B]	.45	.94	1.00
Disorderly Conduct					
Pre-Intervention	.47	1.01	.59	.72	1.01
Intervention 1	.55	1.29	.62	.79	1.11
Intra-Intervention	.52	.84	.47	.72	1.01
Intervention 2	.51	.80	.77	.62	.80
Post-Intervention	.49	1.02	.56	.73	.83[A]
Traffic					
Pre-Intervention	1.07	1.31	1.32	1.33	1.36
Intervention 1	1.06	1.07	1.02	1.35	1.29
Intra-Intervention	1.42[A]	1.32	1.35	1.70[A]	1.61
Intervention 2	1.35[A]	1.24	1.14	1.18[B]	1.27
Post-Intervention	1.55[A]	1.52[A]	1.35	1.55[A]	1.54

[A] $p < .05$ (t-test comparison to Pre-Intervention period), [B] $p < .05$ (t-test comparison to Intra-Intervention period)

We found some evidence of diffusion of benefit effects. Table 5 shows that the mean number of public morals calls significantly decreased between the pre-intervention period and the intra-intervention period around the Redevelopment District and around three of the four zones. However, the mean number of public morals calls also significantly increased between the intra-intervention period and the post-intervention period around two of the four zones. These changes, at least around the Redevelopment District, appear to be modest since the time series analysis did not confirm any significant changes over the course of the project. Additionally, the mean number of physical disorder calls increased significantly between the pre-intervention period and the intra-intervention period and then decreased significantly between the intra-intervention period and the post-intervention period in the areas surrounding the Redevelopment District and around all four of the zones. The time series analysis presented in Table 6 shows that physical disorder calls in the displacement zone outside of the Redevelopment District significantly increased during intervention one, the intra-intervention period, and the post-intervention period when compared to the pre-intervention period.

Table 6: Time Series for the Area Adjoining the Redevelopment District (Displacement and Diffusion Effects).

	Person	Property	Drug	Suspicious Person	Assistance	Public Morals	Physical Disorder	Nuisance	Disorderly Conduct	Traffic
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
ω_2	-.046 (.081)	.177 (.194)	-.013 (.033)	.175 (.094)	.041 (.042)	-.001 (.022)	.149* (.054)	-.020 (.012)	.084 (.060)	-.005 (.122)
ω_3	-.021 (.107)	-.257 (.253)	-.026 (.044)	-.044 (.124)	.026 (.055)	-.046 (.029)	.412* (.071)	.010 (.018)	.053 (.080)	.350* (.159)
ω_4	.143 (.088)	-.099 (.210)	.018 (.036)	-.142 (.102)	.075 (.045)	-.003 (.024)	.111 (.058)	-.009 (.012)	.048 (.065)	.301* (.133)
ω_5	-.028 (.072)	-.034 (.173)	.069* (.030)	.037 (.083)	.090* (.037)	-.025 (.019)	.150* (.048)	-.007 (.009)	.022 (.054)	.482* (.109)
χ^2	25.90 df=24	23.35 df=21	18.82 df=22	21.17 df=23	24.06 df=24	29.84 df=24	21.95 df=22	24.12 df=19	24.52 df=24	21.92 df=22

* $p < .05$

ω_2 = Intervention 1 (compared to Pre-Intervention)

ω_3 = Intra-Intervention (compared to Pre-Intervention)

ω_4 = Intervention 2 (compared to Pre-Intervention)

ω_5 = Post-Intervention (compared to Pre-Intervention)

χ^2 = Ljung-Box statisticDISCUSSION

DISCUSSION

The present study examined a quality-of-life policing project conducted by the Chandler, Arizona Police Department. Operation Restoration consisted of a unit that: 1) aggressively policed social disorder crimes such as prostitution, street level drug dealing, and loitering and 2) addressed physical disorder conditions in the same neighborhoods through activities such as graffiti abatement, property inspections, and removing trash and litter from private and public spaces. We used CFS data obtained from the Chandler Police Department's crime analysis unit and compared pre-intervention, intra-intervention and post-intervention periods to evaluate the impact of the program. This data was also used to account for spatial displacement and diffusion of benefit effects.

The comparison of changes in mean level of CFS for the Redevelopment District and its four zones for ten different categories of crime and disorder resulted in 150 different statistical comparisons, of which 41 were statistically significant, a number that substantially exceeds what one would expect by chance. However, several of the significant changes were in the unintended direction, i.e. an increase rather than a decrease in the mean level of the CFS crime category. One zone in particular, zone four, had an unusually large number of significant pre-and post-intervention changes in mean level CFS that were in the "wrong" direction including crimes against person, property crimes, drug crimes, as well as several of the other categories. Why are the results so different for zone four? One possibility might be due to the fact that zone four was the last zone of the three to receive the intervention, and perhaps the level of effort waned as project officers and staff approached that zone. The data in Table 2 provide mixed evidence in support of this possibility. Compared to the other zones, there were considerably fewer police contacts in zone four during the first intervention, which could be an indication of less effort and consequently a lower dosage.

However, during the second intervention the number of police contacts in zone four greatly exceeded those in the other zones, but still most of the impacts were in the wrong direction. It should be noted that most of the increase in police contacts was in the "field activity" or "citations" categories, while the actual number of arrests decreased. This would seem to suggest that field activity was an ineffective component of the overall intervention. We queried Chandler police officials about the anomalous findings in zone four, and they attributed the increases to differences in the zones, with more gangs and gang members residing in zone four than in the other zones.

Overall, the findings suggest that the quality-of-life initiative had the strongest intended impact on three categories of crime and disorder: public morals, disorderly conduct, and physical disorder. The time-series analyses indicated that the intervention generally resulted in an abrupt and permanent decline in public morals calls in the Redevelopment District. We suggest that these findings lend partial support for the claim that the quality-of-life operation in the Redevelopment District was successful in reducing public morals crimes. This finding should not be surprising. The operational strategy of the Neighborhood Response Team was such that it aggressively enforced "public" forms of crime and disorder. When compared to the other crime categories the officers were more inclined to come in contact with public morals crimes. Public morals crimes (e.g., prostitution and public drinking) are often times the most visible forms of disorder and crime within a neighborhood and as such are perhaps the most suppressible by the police.

We also found that the intervention resulted in a temporary increase in calls for disorderly conduct. It is not clear as to why disorderly conduct calls would increase significantly for a brief time after the completion of the operation. It may be that due to the presence of the officers, residents were more aware of the police department's efforts to

address crime and disorder in their neighborhood. Resident awareness of the operation may have peaked near the end of the operation and increased awareness may have led to a greater number of CFS for disorderly conduct during the operation; and after the completion of the operation (and the subsequent removal of police presence) the impact of the intervention may have decayed. In the case of Chandler's Operation Restoration, the decay might stem from another form of awareness, i.e., awareness that the operation was over and a belief that the police were less likely to respond or be able to respond to calls related to disorderly conduct. Sherman (1990) argues that effect decay is a fairly common pattern in longer-term interventions. However, he goes on to explain that the processes that result in effect decay are not completely understood. Research in the future should consider examining the reasons for effect decay on longer-term interventions in the future.

Additionally, the quality-of-life program had a strong and consistent impact on physical disorder. We found that physical disorder calls increased significantly in the intra-intervention period, however the magnitude of the increase was smaller by the post-intervention period. These findings may suggest that after residents became familiar with the operation, and its focus on physical disorder, they contacted the police more frequently to ensure the physical improvement of their neighborhood. However, after the physical improvement of the neighborhood there may have been fewer physical disorders for the residents to call the police about, resulting in the reduction in the number of calls to the police.

It should also be noted that we found similar patterns to the above in the contiguous areas surrounding intervention sites. The analyses indicated that traffic problems were displaced to contiguous areas. Due to the higher levels of police activity in each targeted zone, traffic violators may have been cognizant of the increased patrol presence and drove to

near-by areas where they believed they might not be as likely to come into contact with the police. A similar pattern was observed for drug calls. We found that in the area just outside of the Redevelopment District calls for drug offenses increased significantly. The increased police presence may have displaced drug use and sales to near-by areas. Last, calls for assistance increased in contiguous areas. We also found strong evidence of a diffusion of benefits to near-by areas for public morals crimes and physical disorder. These findings add to a growing body of literature that suggests that place-oriented interventions impact areas spatially wider than just the targeted area.

In sum there are at least two principal conclusions that can be drawn from the present study. The first is that the program appears to have had an impact on physical and social disorder. Placed in the context of previous research these findings should not necessarily be surprising. Crime specific policing focusing on special problems such as guns (Sherman and Rogan, 1995), drunken driving (Ross, 1982) and drug markets (Sherman and Rogan, 1995; Weisburd and Green, 1995), just to name a few, has repeatedly shown that the police are perhaps most successful when they focus their energy and resources on a particular problem, and not a multitude of problems. While the ultimate goal of quality-of-life policing is to reduce serious crime (through the reduction of disorder), the finding that this operational strategy had a significant impact on disorder should not be discounted. The impact of the project on disorder has important implications for many communities, and there are those who argue that the reduction of physical and social disorder is "justifiable in its own right in that it contributes to the establishment of a civil, livable environment in which citizens may, without fear, exercise their right to pursuit their livelihood, commerce, self-expression, entertainment and so on" (Mastrofski, 1988: 48).

The second principal conclusion of the study is that in comparison to disorder-related crimes and violations, the program did not have as nearly as substantial of an impact on serious crime. In other words, the benefits of the project were primarily restricted to those problems that the project specifically focused on—physical and social disorder. Although the comparison of means resulted in a significant decrease in property crime CFS in three of the four zones, the time series analysis identified a permanent change in the desired direction in only one of the zones. At the same time, we observed a permanent increase in CFS for property crime in another zone after the second intervention. The pattern for the person crime category is also mixed in that the time series analysis indicates a permanent change in the desired direction (decrease) in one zone and a permanent increase in another. Several explanations may account for the failure of the program to have the desired impact on serious crime. First, police removal of social and physical disorder may not immediately result in a change in the social meaning that residents assign to their neighborhood that generates the type of social influence that produces general deterrence. Instead, it may take a substantial amount of time for residents and neighborhoods to re-establish the type and level of orderliness that leads to residents feeling safe and able to enforce local social norms. While there has been some attention to the spiraling decay of neighborhoods and its impact on crime, there has been little research that has examined the processes that lead to the revitalization of neighborhoods (Taylor and Harrell, 2000). Research in the future should further examine the impact that the police response to disorder has on the social meaning that residents assign to their neighborhoods and the impact that it has on residents' attitudes and behavior.

The findings from this study provide very limited support for the operational strategy suggested by Wilson and Kelling for combating crime and disorder or more generally for

social norm theory (Ellickson, 1996; Kahan 1997; Kahan, 1998), which views quality-of-life policing as altering social meanings and producing the social influences that result in general deterrence. This limited support might be the consequence of the nature of the community in which the project took place. Wilson and Kelling (1982) stipulated that police agencies should focus their resources and energy on responding to disorder in communities that are "deteriorating but not unreclaimable." They argued that some neighborhoods are simply beyond repair and are not salvageable. Perhaps the Redevelopment District in Chandler, Arizona is one such community. However, no research to date has empirically examined this claim, nor has there been any research that has determined the tipping point for which a community is beyond repair and cannot be restored.

Of course the other possibility is that the hypothesis is flawed in the first place. The failure of the program to decrease serious crime may be the result of faulty assumptions. To date there has been very little research that has empirically validated the broken windows hypothesis, and the research that has been conducted has not yielded consistent results (See Eck and Maguire, 2000). Obviously, if the theoretical foundation of quality-of-life policing is not correct we should not assume that the strategy would be effective at reducing crime. A growing body of research suggests that one of the most effective ways of controlling crime is to focus on specific types of crimes and places (See Sherman, 1997; Sherman and Weisburd, 1995; Weisburd and Green, 1995). Cordner (1998) notes that quality-of-life initiatives are often times "employed without the benefit of careful problem identification or analysis, without any effort to identify underlying conditions and causes, and without careful consideration of a wide range of possible alternatives" (p. 309). Greene (2000) raises the possibility that some quality-of-life initiatives:

> may actually return the police and the community to a conflictual relationship. Just as important, zero tolerance policing may be returning the community to a passive

> role in crime and order maintenance in favor of a more aggressive and active role on behalf of the police (p.33).

In other words, it may be that some quality-of-life initiatives are counterproductive and have an adverse impact on the community's ability to serve as a partner in the co-production of public safety. Over the long run, weakened links between the community and the police could nullify any short-term gains in serious crime reduction resulting from a quality-of-life policing initiative. We have no evidence that this is what happened in Chandler or that it is responsible for the apparent weak link between reduction of disorder and more serious crime. For now it remains a hypothesis that needs to be examined in future research.

Quality-of-life policing is at the forefront of the public's attention (Roberts, 1999). Police departments across the country are using this police strategy to address a wide range of community and neighborhood problems. The findings of our research, combined with other recent research on broken windows theory (Harcourt, 1998) and quality-of-life policing (Novak et al, 1999; Sherman, 1990) suggests that researchers should further evaluate the relationship between crime and disorder and examine the impact that the police can have on crime by policing social and physical disorder in order to determine if quality-of-life policing is good public policy. Additionally, part of the quality-of-life policing research agenda should be an examination of what Roberts (1999) refers to as the "pernicious impact of order-maintenance policing" (p. 813). She argues that such policing strategies have a differential and undesirable impact on racial minorities since in her view "the categories of order and disorder have a pre-existing meaning that associates Blacks with disorder and lawlessness" (p. 813). If she is correct, then quality-of-life policing initiatives may increase the conflict with and distrust of police in those communities that often need them the most, America's minority communities.

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Appendix 1: Zero-Order Transfer Function by Zone and Type of Crime (Abrupt, Permanent Impact)

Type of Crime	All Zones		Zone I		Zone II		Zone III		Zone IV	
	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error
Person										
α	6.814*	.194	1.518*	.091	1.475*	.062	1.991*	.067	1.851*	.064
ϕ_1	--	--	.077*	.028	--	--	--	--	--	--
ϕ_4	-.067*	.028	--	--	--	--	--	--	--	--
ϕ_8	--	--	.058*	.028	--	--	--	--	--	--
ϕ_{13}	.076*	.028	--	--	--	--	--	--	--	--
ϕ_7	.115*	.028	.065*	.028	--	--	--	--	--	--
ϕ_{14}	.108*	.028	.081*	.028	--	--	--	--	--	--
ω_2	-.185	.307	-.292	.260	-.386*	.197	.053	.164	-.029	.232
ω_3	-.487	.399	.017	.136	-.045	.096	-.176	.113	.022	.115
ω_4	-.060	.333	.069	.261	-.179	.199	-.591*	.223	.171	.232
ω_5	-.304	.275	-.022	.120	-.190*	.085	-.276*	.097	.213*	.101
χ^2	28.62 df=20		31.18 df=20		32.90 df=24		20.96 df=24		33.56 df=24	
Property										
α	10.658*	.252	2.247*	.093	2.124*	.106	3.745*	.123	2.583*	.083
ϕ_1	.164*	.028	.084*	.028	.083*	.028	.152*	.028	.085*	.028
ϕ_3	--	--	--	--	.066*	.028	--	--	--	--
ϕ_4	--	--	--	--	.067*	.028	--	--	--	--
ϕ_{19}	--	--	--	--	--	--	.071*	.028	--	--
ϕ_{23}	--	--	--	--	.071	.029	--	--	--	--
ϕ_7	.083*	.028	--	--	--	--	--	--	--	--
ω_2	.262	.403	-.483	.280	.143	.317	.163	.298	.087	.302
ω_3	.020	.528	.089	.139	.001	.164	-.000	.209	.201	.150
ω_4	.417	.435	-.047	.280	-.595	.322	-.180	.398	.640*	.302
ω_5	-.437	.357	-.239	.123	-.214	.146	-.314	.180	.554*	.132
χ^2	27.96 df=22		14.30 df=23		28.44 df=20		21.70 df=22		23.49 df=23	
Drug										
α	.798*	.058	.204*	.024	.206*	.025	.214*	.021	.152*	.017
ϕ_1	--	--	--	--	.083*	.028	--	--	--	--
ϕ_3	.075*	.028	--	--	--	--	--	--	--	--
ϕ_8	.093*	.028	--	--	--	--	--	--	--	--
ω_2	-.010	.092	-.071	.071	-.028	.079	.006	.053	.092	.063
ω_3	-.148	.120	-.034	.035	-.020	.038	.075*	.036	-.009	.031
ω_4	-.217	.099	-.048	.071	-.160*	.080	-.125	.072	.092	.063
ω_5	-.024	.082	-.017	.031	-.025	.034	-.032	.031	.014	.028
χ^2	26.05 df=22		25.74 df=24		23.88 df=23		16.43 df=24		18.13 df=24	
Suspicious Person										
α	3.892*	.116	.906*	.047	.768*	.042	1.410*	.061	.878*	.049
ϕ_1	.081*	.028	--	--	--	--	--	--	.129*	.028
ϕ_2	--	--	--	--	--	--	.064*	.028	--	--
ω_2	-.169	.186	-.195	.141	-.145	.133	-.256	.150	.173	.179
ω_3	-.078	.245	-.104	.070	-.101	.065	-.010	.104	.200*	.089
ω_4	.004	.201	-.151	.141	-.086	.134	.034	.204	-.010	.179
ω_5	-.269	.165	-.217*	.062	-.178*	.058	-.125	.089	.194*	.079
χ^2	33.24 df=23		25.59 df=24		18.06 df=24		23.24 df=23		19.40 df=23	

α = Constant
ϕ_i = Autoregressive coefficient
θ_i = Moving Average coefficient
ω_i = Intervention coefficient – level of change (phase i)
δ_i = Intervention coefficient – rate of change (phase i)
χ^2 = Ljung-Box statistic

Appendix 1 Continued: Zero-Order Transfer Function by Zone and Type of Crime (Abrupt, Permanent Impact)

Type of Crime	All Zones		Zone I		Zone II		Zone III		Zone IV	
	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error
Assistance										
α	1.028*	.055	.237*	.027	.278*	.025	.297*	.023	.218*	.022
ϕ_1	--	--	--	--	--	--	-.071*	.028	--	--
ω_2	-.040	.087	.008	.081	.055	.081	.010	.056	.049	.080
ω_3	-.056	.115	-.012	.040	-.045	.040	-.058	.039	.045	.040
ω_4	.120	.094	.030	.081	.131	.082	-.119	.076	-.040	.080
ω_5	.039	.077	.078*	.035	-.044	.035	-.039	.033	.081*	.035
χ^2	31.72 df=24		21.89 df=24		14.11 df=24		29.30 df=23		21.13 df=24	
Public Morals										
α	.457*	.034	.121*	.015	.134*	.017	.122*	.015	.074*	.011
ϕ_1	.061*	.028	--	--	--	--	--	--	--	--
ϕ_{14}	--	--	--	--	.065*	.029	--	--	--	--
ω_2	-.118*	.054	.012	.046	-.043	.054	-.001	.037	-.008	.040
ω_3	-.287*	.071	-.067*	.023	-.075*	.027	-.031	.026	-.050*	.020
ω_4	-.091	.058	-.032	.046	-.040	.054	.011	.050	.059	.040
ω_5	-.161*	.048	-.047*	.020	-.036	.024	-.046*	.022	-.008	.017
χ^2	28.82 df=23		27.58 df=24		25.88 df=23		23.28 df=24		25.44 df=24	
Physical Disorder										
α	.863*	.084	.152*	.028	.089*	.019	.331*	.036	.287*	.033
ϕ_1	--	--	--	--	--	--	--	--	--	--
ϕ_6	--	--	--	--	.065*	.028	--	--	--	--
ϕ_{23}	-.069*	.029	--	--	--	--	--	--	--	--
ϕ_7	.057*	.028	--	--	--	--	--	--	--	--
ϕ_{14}	--	--	--	--	--	--	--	--	--	--
ϕ_{21}	.143*	.029	--	--	--	--	.081*	.029	--	--
ω_2	.177	.133	.026	.085	.066	.060	.162	.087	-.198	.122
ω_3	.699*	.174	.110*	.042	.072*	.029	.167*	.061	.217*	.060
ω_4	.476*	.144	.226*	.085	.091	.061	.209	.116	-.042	.122
ω_5	.244*	.119	.099*	.037	.004	.026	.087	.052	.084	.053
χ^2	28.24 df=21		22.29 df=24		23.11 df=23		29.01 df=23		25.98 df=24	

α = Constant
ϕ_I = Autoregressive coefficient
θ_I = Moving Average coefficient
ω_I = Intervention coefficient (phase i)
χ^2 = Ljung-Box statistic

Appendix 1 Continued: Zero-Order Transfer Function by Zone and Type of Crime (Abrupt, Permanent Impact)

Type of Crime	All Zones		Zone I		Zone II		Zone III		Zone IV	
	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error
Nuisance										
α	-.026	.026	-.014	.009	-.008	.006	.002	.005	.001	.007
ϕ_1	--	--	.082*	.028	--	--	--	--	--	--
ϕ_8	.103*	.028	--	--	--	--	--	--	--	--
ϕ_{13}	.100*	.028	--	--	--	--	--	--	--	--
ϕ_{15}	.102*	.028	.098*	.028	--	--	--	--	--	--
ϕ_7	-.859*	.020	--	--	--	--	--	--	--	--
θ_1	-.157*	.028	--	--	-.078*	.028	--	--	-.081*	.028
θ_5	--	--	--	--	-.064*	.028	--	--	--	--
θ_{13}	--	--	--	--	-.091*	.028	--	--	--	--
θ_7	--	--	.894*	.013	.910*	.012	.913*	.012	.896*	.013
θ_{14}	.804*	.023	--	--	--	--	--	--	--	--
ω_2	.046	.047	-.035	.046	.002	.038	.022	.019	.041	.050
ω_3	.041	.070	.025	.013	.015	.010	-.010	.010	-.023	.015
ω_4	.005	.050	-.002	.043	-.035	.037	-.024	.034	.127*	.049
ω_5	.012	.038	.014	.011	.007	.009	-.004	.008	-.014	.012
χ^2	26.67 df=18		26.74 df=21		22.23 df=20		16.25 df=23		17.87 df=22	
Disorderly Conduct										
α	3.429*	.112	.909*	.050	.772*	.045	.963*	.045	.906*	.043
ϕ_6	.107*	.028	--	--	--	--	--	--	--	--
ϕ_8	.084*	.028	--	--	--	--	--	--	--	--
ϕ_{11}	-.065*	.028	--	--	--	--	--	--	--	--
ϕ_{18}	-.102*	.028	--	--	--	--	--	--	--	--
ϕ_7	--	--	--	--	.091*	.028	--	--	--	--
ϕ_{21}	.093*	.029	--	--	--	--	--	--	--	--
ω_2	.339	.178	.202	.150	.135	.142	.147	.110	.072	.158
ω_3	-.247	.234	-.059	.075	-.142*	.070	-.066	.076	.037	.078
ω_4	-.075	.193	.091	.150	-.344*	.143	-.074	.150	-.039	.158
ω_5	-.143	.158	-.142*	.066	-.083	.062	-.032	.065	.020	.069
χ^2	29.05 df=19		31.89 df=24		25.99 df=23		30.34 df=24		23.15 df=24	
Traffic										
α	4.138*	.143	.851*	.047	.637*	.042	1.542*	.072	1.000*	.044
ϕ_6	--	--	--	--	--	--	-.065*	.028	--	--
ϕ_8	.074*	.028	--	--	--	--	--	--	--	--
ϕ_{15}	--	--	--	--	--	--	.081*	.029	--	--
ϕ_{14}	.136*	.028	--	--	--	--	.123*	.028	--	--
ω_2	-.274	.227	.260	.141	.185	.133	.032	.171	.067	.161
ω_3	-.125	.296	-.161*	.070	.068	.065	.142	.121	-.152	.080
ω_4	-.359	.245	-.185	.141	-.114	.134	-.261	.227	.178	.161
ω_5	-.236	.203	-.188*	.062	-.032	.058	-.054	.105	.155*	.070
χ^2	31.02 df=22		27.93 df=24		26.22 df=24		25.60 df=21		21.69 df=24	

α = Constant
ϕ_I = Autoregressive coefficient
θ_I = Moving Average coefficient
ω_I = Intervention coefficient (phase i)
χ^2 = Ljung-Box statistic

Appendix 2: First-Order Transfer Function Applied to a Step Series by Zone and Type of Crime (Gradual, Permanent Impact)

Type of Crime	All Zones		Zone I		Zone II		Zone III		Zone IV	
	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error
Person										
α	6.818*	.194	1.508*	.087	1.477*	.062	1.994*	.067	1.811*	.062
ϕ_1	--	--	.077*	.028	--	--	--	--	--	--
ϕ_4	-.067*	.028	--	--	--	--	--	--	--	--
ϕ_8	--	--	.057*	.028	--	--	--	--	--	--
ϕ_{13}	.076*	.029	--	--	--	--	--	--	--	--
ϕ_7	.115*	.028	.065*	.029	--	--	--	--	--	--
ϕ_{14}	.109*	.029	.082*	.029	--	--	--	--	--	--
ω_2	-.186	.307	-.281	.259	-.389*	.197	.050	.164	.012	.232
ω_3	-.111	.387	.108	.235	-.078	.463	-.265	.649	.002	.003
δ_3	.792	.725	-.981*	.110	-.556	8.923	-.464	3.520	.993*	.021
ω_4	-.051	.339	-.058	.260	-.182	.200	-.596*	.223	.013	.315
ω_5	-.563	.556	-.035	.261	-.211	1.237	-.257	1.412	.301	.820
δ_5	-.844	1.006	-.830	9.165	-.095	6.414	.076	5.059	-.570	3.798
χ^2	28.67 df=20		30.93 df=20		32.94 df=24		21.18 df=24		32.94 df=24	
Property										
α	10.633*	.232	2.266*	.093	2.151*	.090	3.708*	.120	2.580*	.075
ϕ_1	.164*	.028	.085*	.028	.085*	.028	.152*	.028	.088*	.028
ϕ_3	--	--	--	--	.067*	.028	--	--	--	--
ϕ_4	--	--	--	--	.066*	.028	--	--	--	--
ϕ_{19}	--	--	--	--	--	--	.071*	.028	--	--
ϕ_{23}	--	--	--	--	.074*	.029	--	--	--	--
ϕ_7	.083*	.029	--	--	--	--	--	--	--	--
ω_2	.288	.391	-.501	.281	.118	.313	.201	.296	.091	.301
ω_3	.272	.580	.063	1.153	-.128	.180	.185	.373	.385*	.183
δ_3	-.998*	.037	.118	16.158	-.998*	.006	-.962*	.208	-1.000*	.002
ω_4	.443	.424	-.066	.283	-.623*	.318	-.137	.397	.644*	.301
ω_5	-.370	3.692	-.518*	.235	-.148	1.196	-.221	1.997	1.093*	.243
δ_5	.118	8.804	-.917*	.269	.396	4.883	.207	7.166	-.923*	.131
χ^2	27.52 df=22		14.28 df=23		29.13 df=20		22.66 df=22		22.29 df=23	
Drug										
α	.761*	.052	.210*	.024	.221*	.023	.212*	.021	.153*	.017
ϕ_1	--	--	--	--	.085*	.028	--	--	--	--
ϕ_3	.078*	.028	--	--	--	--	--	--	--	--
ϕ_8	.093	.028	--	--	--	--	--	--	--	--
ω_2	.027	.089	-.077	.071	-.043	.078	.008	.052	.091	.063
ω_3	-.029	.172	-.015	.124	-.000*	.000	.157*	.067	-.019	.109
δ_3	.746	1.490	.650	2.931	.999*	.001	-.974*	.037	-.665	8.567
ω_4	-.178	.098	-.053	.075	-.058	.085	-.122	.072	.091	.063
ω_5	.105	.128	-.002	.012	.110	.080	-.048	.237	.023	.176
δ_5	-1.000	.008	.943*	.433	-.999*	.004	-.559	7.561	-.613	12.032
χ^2	27.40 df=22		25.66 df=24		21.69 df=23		16.20 df=24		18.19 df=24	
Suspicious Person										
α	3.919*	.114	.914*	.047	.770*	.042	1.409	.061	.870*	.049
ϕ_1	.081*	.028	--	--	--	--	--	--	.128*	.028
ϕ_2	--	--	--	--	--	--	.064*	.028	--	--
ω_2	-.195	.185	-.203	.141	-.148	.133	-.256	.150	.182	.179
ω_3	-.243	.434	-.030	.163	-.190	.155	-.005	.484	.371	.202
δ_3	-.942*	.335	.716	1.370	-.779	1.096	.546	45.796	-.747	.714
ω_4	-.022	.200	-.151	.152	-.089	.134	.035	.211	-.000	.179
ω_5	-.008	.019	-.340	.513	-.274	.482	-.150	1.136	.010	.022
δ_5	.975*	.056	-.509	2.260	-.513	2.636	-.206	9.137	.957*	.098
χ^2	32.98 df=23		25.58 df=24		18.15 df=24		23.06 df=23		19.43 df=23	

α = Constant
ϕ_i = Autoregressive coefficient
θ_i = Moving Average coefficient
ω_i = Intervention coefficient – level of change (phase i)
δ_i = Intervention coefficient – rate of change (phase i)
χ^2 = Ljung-Box statistic

Appendix 2 Continued: First-Order Transfer Function Applied to a Step Series by Zone and Type of Crime (Gradual, Permanent Impact)

Type of Crime	All Zones		Zone I		Zone II		Zone III		Zone IV	
	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error
Assistance										
α	.994*	.049	.238*	.027	.280*	.025	.305*	.023	.211*	.021
ϕ_1	--	--	--	--	--	--	-.070*	.028	--	--
ω_2	-.007	.084	.006	.081	.053	.081	.001	.056	.055	.079
ω_3	-.086	.200	-.008	.257	-.021	.196	-.063	.367	.102	.073
δ_3	-.969*	.220	.421	17.554	.548	4.100	.055	5.514	-.955*	.138
ω_4	.153	.091	.029	.083	.130	.085	-.127	.077	-.033	.079
ω_5	.000	.000	.063	.483	-.056	.469	-.116	.064	.000	.000
δ_5	1.007*	.008	.177	6.309	-.221	10.184	-.987*	.031	1.001*	.006
χ^2	32.78 df=24		22.06 df=24		14.12 df=24		27.65 df=23		22.39 df=24	
'Public Morals										
α	.456*	.034	.121*	.015	.134*	.017	.122*	.015	.075*	.011
ϕ_1	.061*	.028	--	--	--	--	--	--	--	--
ϕ_{14}	--	--	--	--	.065*	.029	--	--	--	--
ω_2	-.117*	.054	.012	.046	-.043	.054	-.001	.037	-.008	.040
ω_3	-.214	.387	-.002	.002	-.054	.197	-.003	.015	-.004	.008
δ_3	.255	1.345	.973*	.030	.295	2.581	.912*	.420	.936*	.149
ω_4	-.089	.058	.010	.056	-.040	.055	.020	.066	.075	.055
ω_5	-.217	.447	-.064	.207	-.048	.275	-.067	.205	-.014	.099
δ_5	-.360	2.781	-.411	4.533	-.294	7.448	-.463	4.412	-.646	11.269
χ^2	29.86 df=23		27.22 df=24		25.85 df=23		25.02 df=24		25.64 df=24	
Physical Disorder										
α	.848*	.083	.149*	.025	.086*	.019	.328*	.036	.281*	.033
ϕ_6	--	--	--	--	.066*	.028	--	--	--	--
ϕ_{23}	-.074*	.029	--	--	--	--	--	--	--	--
ϕ_7	.059*	.028	--	--	--	--	--	--	--	--
ϕ_{14}	--	--	--	--	--	--	--	--	--	--
ϕ_{21}	.142*	.029	--	--	--	--	.081*	.029	--	--
ω_2	.192	.132	.028	.084	.069	.060	.165	.087	-.192	.122
ω_3	1.391*	.309	.001	.001	.155*	.055	.329*	.114	.447*	.115
δ_3	-.839*	.155	.996*	.006	-.951*	.076	-.872*	.253	-.881*	.190
ω_4	.495*	.143	.049	.116	.095	.061	.214	.116	-.034	.122
ω_5	.077	.401	.019	.453	.003	.210	.043	.391	.032	.292
δ_5	.709	1.509	.301	16.906	.502	31.356	.522	4.306	.648	3.178
χ^2	28.84 df=21		22.30 df=24		22.96 df=23		29.04 df=23		25.65 df=24	

α = Constant
ϕ_i = Autoregressive coefficient
θ_i = Moving Average coefficient
ω_i = Intervention coefficient – level of change (phase i)
δ_i = Intervention coefficient – rate of change (phase i)
χ^2 = Ljung-Box statistic

Appendix 2 Continued: First-Order Transfer Function Applied to a Step Series by Zone and Type of Crime (Gradual, Permanent Impact)

Type of Crime	All Zones		Zone I		Zone II		Zone III		Zone IV	
	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error
Nuisance										
α	-.027	.027	-.014	.009	-.008	.006	.002	.005	.002	.007
ϕ_1	--	--	.082*	.028	--	--	--	--	--	--
ϕ_8	.103*	.028	--	--	--	--	--	--	--	--
ϕ_{13}	.100*	.028	--	--	--	--	--	--	--	--
ϕ_{15}	.101*	.028	.099*	.028	--	--	--	--	--	--
ϕ_7	-.859*	.020	--	--	--	--	--	--	--	--
θ_1	-.157*	.028	--	--	-.078*	.028	--	--	-.081*	.028
θ_5	--	--	--	--	-.064*	.028	--	--	--	--
θ_{13}	--	--	--	--	-.091*	.028	--	--	--	--
θ_7	--	--	.894*	.013	.910*	.012	.913*	.012	.896*	.013
θ_{14}	.803*	.023	--	--	--	--	--	--	--	--
ω_2	.047	.048	-.034	.046	.002	.038	.022	.019	.032	.051
ω_3	.003	.019	.025	.356	.030	.058	-.011	.331	-.001	.001
δ_3	.946*	.425	-.030	14.397	-.896	3.523	-.101	32.709	.980*	.047
ω_4	.001	.064	-.002	.044	-.034	.052	-.024	.035	.160	.084
ω_5	.013	.996	.024	.161	.001	.055	-.009	.016	-.023	.247
δ_5	-.089	81.287	-.747	11.451	.840	7.780	-1.001*	.075	-.671	17.742
χ^2	26.47 df=18		26.81 df=21		22.25 df=20		16.27 df=23		17.83 df=22	
Disorderly Conduct										
α	3.384*	.099	.915*	.049	.787*	.043	.983*	.039	.902*	.043
ϕ_6	.106*	.028	--	--	--	--	--	--	--	--
ϕ_8	.084*	.028	--	--	--	--	--	--	--	--
ϕ_{11}	-.064*	.028	--	--	--	--	--	--	--	--
ϕ_{18}	-.102*	.028	--	--	--	--	--	--	--	--
ϕ_7	--	--	--	--	.087	.028	--	--	--	--
ϕ_{21}	.094*	.029	--	--	--	--	--	--	--	--
ω_2	.383*	.171	.196	.150	.122	.140	.127	.108	.075	.158
ω_3	-.127	.950	-.004	.019	-.002	.002	-.029	.228	.032	.669
δ_3	.399	4.480	.953*	.254	.994*	.010	.688	2.407	.210	16.566
ω_4	-.030	.186	.115	.203	-.146	.185	-.089	.158	-.036	.160
ω_5	-.111	.234	-.049	.329	-.001	.010	-.000	.000	.056	.179
δ_5	-1.002*	.010	.678	2.145	.982*	.156	1.013*	.010	-.830	4.469
χ^2	29.13 df=19		32.39 df=24		24.96 df=23		29.71 df=24		22.95 df=24	
Traffic										
α	4.068*	.137	.864*	.047	.634*	.041	1.534*	.072	1.000*	.044
ϕ_6	--	--	--	--	--	--	-.065*	.029	--	--
ϕ_8	.074*	.029	--	--	--	--	--	--	--	--
ϕ_{15}	--	--	--	--	--	--	.080*	.029	--	--
ϕ_{14}	.135*	.029	--	--	--	--	.124*	.029	--	--
ω_2	-.204	.222	.247	.141	.188	.133	.040	.171	.067	.161
ω_3	.004	.005	-.024	.069	.157	.121	.297	.226	-.030	.131
δ_3	.998*	.012	.871*	.360	-.954*	.160	-.871	.534	.809	.825
ω_4	-.565	.600	-.169	.169	-.111	.135	-.251	.227	.193	.180
ω_5	-.135	1.101	-.283	.628	-.062	.111	-.036	1.195	.301*	.141
δ_5	.585	3.141	-.412	3.115	-.928	1.059	.218	26.071	-.901*	.401
χ^2	30.37 df=22		27.39 df=24		26.39 df=24		24.67 df=21		21.85 df=24	

α = Constant
ϕ_i = Autoregressive coefficient
θ_i = Moving Average coefficient
ω_i = Intervention coefficient – level of change (phase i)
δ_i = Intervention coefficient – rate of change (phase i)
χ^2 = Ljung-Box statistic

Appendix 3: First-Order Transfer Function Applied to a Pulse Series by Zone and Type of Crime (Abrupt, Temporary Impact)

Type of Crime	All Zones		Zone I		Zone II		Zone III		Zone IV	
	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error
Person										
α	6.655*	.137	1.516*	.051	1.393*	.037	1.853*	.043	1.952*	.046
ϕ_1	--	--	.077*	.028	--	--	--	--	--	--
ϕ_4	-.067*	.028	--	--	--	--	--	--	--	--
ϕ_8	--	--	.058*	.029	--	--	--	--	--	--
ϕ_{13}	.078*	.029	--	--	--	--	--	--	--	--
ϕ_7	.117*	.028	.063*	.029	--	--	--	--	--	--
ϕ_{14}	.107*	.029	.085*	.029	--	--	--	--	--	--
ω_2	-.037	.277	-.307	.250	-.304	.191	.191	.156	-.130	.228
ω_3	-.866	1.073	-1.419	1.286	-.891	1.075	-1.938	1.429	-1.315*	.550
δ_3	.969*	.060	.333	.779	.721	.470	-.234	.679	.964*	.022
ω_4	.117	.299	-.076	.250	-.098	.193	-.453*	.218	.071	.228
ω_5	.254	.337	-1.085	1.159	-.738	1.227	.124	.480	1.048	1.496
δ_5	-.997*	.009	-.619	.550	.473	1.165	-.971*	.163	.016	1.427
χ^2	28.49 df=20		31.10 df=20		33.27 df=24		24.47 df=24		33.79 df=24	
Property										
α	10.446*	.169	2.169*	.053	2.046*	.065	3.606*	.084	2.793*	.059
ϕ_1	.165*	.028	.094*	.028	.090*	.028	.153*	.028	.099*	.028
ϕ_3	--	--	--	--	.068*	.028	--	--	--	--
ϕ_4	--	--	--	--	.070*	.028	--	--	--	--
ϕ_{19}	--	--	--	--	--	--	.071*	.028	--	--
ϕ_{23}	--	--	--	--	.079*	.029	--	--	--	--
ϕ_7	.091*	.029	--	--	--	--	--	--	--	--
ω_2	.483	.359	-.406	.273	.172	.314	.308	.285	-.114	.302
ω_3	4.804	3.608	-1.070	1.164	-2.342	1.380	.665	.839	4.175*	1.795
δ_3	.563	.477	-.807*	.291	.703*	.264	.969*	.586	.098	.426
ω_4	.634	.394	.027	.273	-.487	.315	-.034	.387	.438	.303
ω_5	2.253	1.404	-1.888	1.154	2.307	1.492	.909	1.226	2.933	1.797
δ_5	-.944*	.048	-.812*	.160	-.426	.475	-.867*	.248	-.448	.559
χ^2	29.18 df=22		17.93 df=23		28.66 df=20		23.32 df=22		31.91 df=23	
Drug										
α	.780*	.040	.187*	.013	.200*	.017	.217*	.014	.160*	.013
ϕ_1	--	--	--	--	.081*	.028	--	--	--	--
ϕ_3	.071*	.028	--	--	--	--	--	--	--	--
ϕ_8	.096*	.028	--	--	--	--	--	--	--	--
ω_2	.007	.081	-.054	.068	-.022	.076	.003	.050	.085	.062
ω_3	-.409	.335	.817	.450	-.234	.455	1.827*	.456	-.154	.121
δ_3	.972*	.033	-.162	.530	.462	1.426	.275	.222	.976*	.027
ω_4	-.189*	.089	-.032	.068	-.154*	.077	-.128	.070	.085	.062
ω_5	5.186*	.900	-.313	.448	-.161	.127	-.302	.400	.844*	.407
δ_5	-.194	.164	-.320	1.224	.983*	.019	.695	.562	-.109	.473
χ^2	27.38 df=22		26.63 df=24		23.06 df=23		15.32 df=24		18.62 df=24	
Suspicious Person										
α	3.757*	.088	.786*	.026	.673*	.025	1.367*	.040	.980*	.034
ϕ_1	.080*	.028	--	--	--	--	--	--	.135*	.028
ϕ_2	.092*	.029	--	--	--	--	.061*	.028	--	--
ω_2	-.031	.181	-.074	.136	-.051	.129	-.214	.142	.078	.177
ω_3	1.380	1.917	.972	.838	-.721	.841	-.561	.405	1.505	.994
δ_3	.625	.738	.595	.478	-.382	.931	-.975*	.026	-.351	.528
ω_4	.132	.199	-.030	.136	.009	.131	.076	.198	-.117	.177
ω_5	.666	1.122	-.794	.897	-.694	.850	-.596	.733	-1.171	.941
δ_5	.922*	.193	-.135	1.099	-.180	1.167	.904*	.168	-.523	.500
χ^2	25.05 df=22		26.57 df=24		21.95 df=24		24.06 df=23			

α = Constant
ϕ_i = Autoregressive coefficient
θ_i = Moving Average coefficient
ω_i = Intervention coefficient – level of change (phase i)
δ_i = Intervention coefficient – rate of change (phase i)
χ^2 = Ljung-Box statistic

Appendix 3 Continued: First-Order Transfer Function Applied to a Pulse Series by Zone and Type of Crime (Abrupt, Temporary Impact)

Type of Crime	All Zones		Zone I		Zone II		Zone III		Zone IV	
	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error
Assistance										
α	1.067*	.042	.267*	.015	.251*	.016	.278*	.016	.258*	.016
ϕ_1	--	--	--	--	--	--	-.074*	.028	--	--
ω_2	-.079	.080	-.023	.078	.082	.079	.028	.053	.009	.078
ω_3	-.217	1.035	.743	.515	.730	.517	-.254	.161	.752	.515
δ_3	-.326	4.048	-.219	.644	-.152	.657	.971*	.026	-.213	.640
ω_4	.081	.088	-.001	.078	.158*	.079	-.100	.074	-.080	.078
ω_5	-.423	.274	-.370	.513	-.189	.276	-.382	.507	-.214	.179
δ_5	.982*	.017	-.300	1.209	.919*	.167	.432	.972	.968*	.038
χ^2	31.45 df=24		23.21 df=24		13.17 df=24		29.91 df=23		20.80 df=24	
Public Morals										
α	.457*	.034	.087*	.009	.102*	.010	.099*	.010	.077*	.011
ϕ_1	.057*	.028	--	--	--	--	--	--	--	--
ϕ_{14}	--	--	--	--	.070*	.029	--	--	--	--
ω_2	-.118*	.054	.046	.045	-.011	.052	.022	.035	-.010	.040
ω_3	-.358*	.078	-.399	.267	-.132	.299	-.394	.278	-.086*	.034
δ_3	.998*	.001	-.647*	.327	.635	1.143	-.710*	.286	.996*	.003
ω_4	.156*	.060	.002	.045	-.008	.053	.034	.049	.083*	.041
ω_5	-.336	.588	-.094	.094	-.139	.222	-.150	.176	-.083	.188
δ_5	.515	1.166	.973*	.038	.853*	.339	.914*	.143	.826	.568
χ^2	29.39 df=23		29.10 df=24		27.99 df=23		24.17 df=24		25.35 df=24	
Physical Disorder										
α	1.065*	.059	.223*	.016	.109*	.011	.399*	.023	.287*	.033
ϕ_6	--	--	--	--	.071*	.028	--	--	--	--
ϕ_{14}	--	--	--	--	--	--	--	--	--	--
ϕ_{22}	.062*	.029	--	--	--	--	--	--	--	--
ϕ_{23}	-.089*	.029	--	--	--	--	--	--	--	--
ϕ_7	.070*	.028	--	--	--	--	--	--	--	--
ϕ_{21}	.149*	.029	--	--	--	--	.089*	.029	--	--
ω_2	-.026	.124	-.046	.082	.045	.059	.095	.083	-.198	.122
ω_3	3.825*	1.294	-.299	.496	-.092	.361	1.687*	.709	.200*	.099
δ_3	-.552*	.207	.633	.837	.023	3.930	-.117	.412	1.001*	.003
ω_4	.251	.137	.154	.082	.071	.059	.132	.113	-.280	.172
ω_5	-1.275	1.300	-.228	.542	-.107	.358	-.344	.709	-.171	.163
δ_5	.518	.667	.039	2.375	.340	2.796	.212	1.922	1.001*	.006
χ^2	26.46 df=20		25.36 df=24		22.83 df=23		26.51 df=23		26.12 df=24	

α = Constant
ϕ_i = Autoregressive coefficient
θ_i = Moving Average coefficient
ω_i = Intervention coefficient – level of change (phase i)
δ_i = Intervention coefficient – rate of change (phase i)
χ^2 = Ljung-Box statistic

Appendix 3 Continued: First-Order Transfer Function Applied to a Pulse Series by Zone and Type of Crime (Abrupt, Temporary Impact)

Type of Crime	All Zones		Zone I		Zone II		Zone III		Zone IV	
	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error	Coeff-icient	Standard Error
Disorderly Conduct										
α	3.315*	.075	.821*	.029	.705	.027	.929*	.029	.923*	.031
ϕ_6	.109*	.028	--	--	--	--	--	--	--	--
ϕ_8	.085	.028	--	--	--	--	--	--	--	--
ϕ_{11}	-.059	.028	--	--	--	--	--	--	--	--
ϕ_{18}	-.101	.028	--	--	--	--	--	--	--	--
ϕ_7	--	--	--	--	.094*	.028	--	--	--	--
ϕ_{21}	.095	.029	--	--	--	--	--	--	--	--
ω_2	.453*	.159	.291*	.143	.203	.138	.181	.104	.055	.154
ω_3	1.403	1.847	.280	.348	.511	.830	3.071*	.957	-.497	.427
δ_3	-.276	1.172	.963*	.065	-.317	1.394	.014	.311	.952*	.059
ω_4	.048	.175	.180	.143	-.278*	.139	-.040	.145	-.056	.154
ω_5	3.491*	1.571	5.190*	.941	-.670	.833	1.628*	.826	2.834*	.940
δ_5	.707*	.192	-.122	.177	.205	1.169	.710*	.205	.611*	.177
χ^2	29.30 df=19		31.46 df=24		28.48 df=23		29.62 df=24		23.85 df=24	
Traffic										
α	4.013*	.096	.733*	.027	.642*	.025	1.550*	.046	1.016*	.030
ϕ_6	--	--	--	--	--	--	-.062*	.029	--	--
ϕ_{15}	--	--	--	--	--	--	.082*	.029	--	--
ϕ_7	.081*	.028	--	--	--	--	--	--	--	--
ϕ_{14}	.133*	.029	--	--	--	--	.123*	.029	--	--
ω_2	-.146	.203	.378*	.135	.181	.129	.022	.163	.051	.158
ω_3	.679	2.114	3.306*	.824	1.398	.756	1.377	1.305	-1.551*	.704
δ_3	.484	2.150	-.610*	.134	-.673*	.246	-.407	.734	-.859*	.091
ω_4	-.227	.223	-.066	.135	-.119	.130	-.270	.219	.162	.158
ω_5	2.627	1.917	-.572	.5115	-.673	.808	1.270	1.316	.938	1.026
δ_5	-.694	.310	.902*	.125	-.552	.732	-.304	.902	.400	.852
χ^2	29.37 df=22		27.84 df=24		27.65 df=24		26.79 df=21		26.64 df=24	
Nuisance										
α	-.037	023	-.002	.005	-.005	.005	-.002	.004	-.009	.006
ϕ_1	--	--	.092*	.028	--	--	--	--	--	--
ϕ_8	.093*	.028	--	--	--	--	--	--	--	--
ϕ_{13}	.091*	.028	--	--	--	--	--	--	--	--
ϕ_{15}	.095*	.028	.106*	.028	--	--	--	--	--	--
ϕ_7	-.868*	.019	--	--	--	--	--	--	--	--
θ_1	-.151*	.028	--	--	-.078*	.028	--	--	-.080*	.028
θ_5	--	--	--	--	-.064*	.028	--	--	--	--
θ_{13}	--	--	--	--	-.091*	.028	--	--	--	--
θ_7	--	--	.888*	.013	.910*	.012	.911*	.012	.893*	.013
θ_{14}	.816*	.022	--	--	--	--	--	--	--	--
ω_2	.059	.044	-.047	.044	.013	.038	.021	.019	.005	.065
ω_3	.078	.117	.011	.031	-.056	.167	.502	.354	.383	.650
δ_3	.993*	.025	-1.005*	.006	-.996*	.023	-.792*	.321	.831*	.325
ω_4	-.058	.085	-.001	.045	-.050	.046	-.032	.034	.059	.066
ω_5	1.712	1.015	.449	.417	.042	.048	-.123	.318	.635	.663
δ_5	.908*	.064	-.603	.534	.990*	.013	-.970*	.198	.797	.257
χ^2	23.30 df=18		26.37 df=21		21.92 df=20		16.63 df=23		17.50 df=22	

α = Constant
ϕ_i = Autoregressive coefficient
θ_i = Moving Average coefficient
ω_i = Intervention coefficient – level of change (phase i)
δ_i = Intervention coefficient – rate of change (phase i)
χ^2 = Ljung-Box statistic

Appendix 4: Time Series for the Area Adjoining the Redevelopment District (Displacement and Diffusion Effects).

	Person	Property	Drug	Suspicious Person	Assistance	Public Morals	Physical Disorder	- Nuisance	Disorderly Conduct	Traffic
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
α	.917*	2.394*	.091*	1.005*	.182*	.074*	.156*	.007	.466*	1.065
	(.051)	(.122)	(.021)	(.059)	(.026)	(.014)	(.034)	(.006)	(.038)	(.077
ϕ_1	--	.102*	.112*	.073*	--	--	.058*	--	--	--
		(.028)	(.028)	(.028)			(.028)			
ϕ_7	--	.058*	--	--	--	--	.062*	--	--	--
		(.028)					(.029)			
ϕ_9	--	--	--	--	--	--	--	--	--	.080
										(.029)
ϕ_{10}	--	--	--	--	--	--	--	.105*	--	--
								(.029)		
ϕ_{12}	--	--	.077*	--	--	--	--	--	--	--
			(.028)							
ϕ_{14}	--	.082*	--	--	--	--	--	--	--	--
		(.029)								
ϕ_{21}	--	--	--	--	--	--	--	--	--	.106
										(.029)
θ_1	--	--	--	--	--	--	--	-.056*	--	--
								(.029)		
θ_7	--	--	--	--	--	--	--	.931*	--	--
								(.029)		
θ_{14}	--	--	--	--	--	--	--	-.089*	--	--
								(.039)		
θ_{21}	--	--	--	--	--	--	--	.060*	--	--
								(.029)		
ω_2	-.046	.177	-.013	.175	.041	-.001	.149*	-.020	.084	-.005
	(.081)	(.194)	(.033)	(.094)	(.042)	(.022)	(.054)	(.012)	(.060)	(.122)
ω_3	-.021	-.257	-.026	-.044	.026	-.046	.412*	.010	.053	.350*
	(.107)	(.253)	(.044)	(.124)	(.055)	(.029)	(.071)	(.018)	(.080)	(.159)
ω_4	.143	-.099	.018	-.142	.075	-.003	.111	-.009	.048	.301*
	(.088)	(.210)	(.036)	(.102)	(.045)	(.024)	(.058)	(.012)	(.065)	(.133)
ω_5	-.028	-.034	.069*	.037	.090*	-.025	.150*	-.007	.022	.482*
	(.072)	(.173)	(.030)	(.083)	(.037)	(.019)	(.048)	(.009)	(.054)	(.109)
χ^2	25.90 df=24	23.35 df=21	18.82 df=22	21.17 df=23	24.06 df=24	29.84 df=24	21.95 df=22	24.12 df=19	24.52 df=24	21.92 df=22

* $p < .05$

α = Constant

ϕ_i = Autoregressive coefficient

θ_i = Moving Average coefficient

χ^2 = Ljung-Box statistic

ω_2 = Intervention 1 (compared to Pre-Intervention)

ω_3 = Intra-Intervention (compared to Pre-Intervention)

ω_4 = Intervention 2 (compared to Pre-Intervention)

ω_5 = Post-Intervention (compared to Pre-Intervention)