

Incidence of Crimes and Effectiveness of Interventions in the National Capital Region: Evidence from Panel Data

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Efforts to bring down the incidence of crimes have been intensified by the Philippine National Police (PNP). The index crimes are prioritized among these crimes. The index crimes include theft, robbery, carnapping, and motornapping. Interventions to bring down the incidence of crimes have recently been enacted by the National Capital Region Police Office (NCRPO) of the PNP. These interventions include increases in number of police personnel, mobile patrols, beat patrols, and checkpoints. In this study, the effect of each of these interventions is examined in a panel data analysis using weekly data gathered from all of the police stations in NCR. This paper performs a district-level analysis of the crimes and interventions. The negative binomial regression model for panel data is used to quantify the effects of the interventions on the incidence of index crimes. Results show that some (but not all) of these interventions are effective in reducing crime. The results also show differences in the effects of the interventions across the different districts. Resources should thus be redirected towards these effective strategies. The differences in the effects of the interventions among the different crimes are also studied.

Keywords: index crimes, intervention, panel data, negative binomial regression

1. Introduction

The safety of one's person and security of one's property are widely viewed as basic human rights and are essential to the community's overall quality of life

(Plant and Scott, 2009). People envision a society in which they play an active role in peace and development, engaging in the promotion of social integration as they seek unity in diversity with social justice. However, it has been a global phenomenon that crime is on the rise. Crime has had great impact on individuals and communities and has high and diverse costs. There is terrible physical, material, mental, and emotional injury that is suffered by its victims.

The Philippines has not been spared from the daily occurrence of crimes, especially in metropolis areas like the National Capital Region (NCR). Kiunisala et al. (2004) observe that the rising tide of criminality has disrupted the normal functions of government entities in the region.

The Philippine National Police (PNP) has enacted a set of interventions to address this problem. These interventions, described in detail in this paper, were enacted starting June 2014. This paper aims to determine which interventions are effective and the police districts where they should be deployed. The researchers also look at the trends in crimes in the different districts in NCR, and fit a statistical model that establishes the relationship between the crimes and interventions.

1.1 Significance of the study

Understanding the effects of the interventions implemented by the PNP to reduce crime will provide useful information on improving the system and policy strategies of the PNP. Recognizing the real effects of the interventions results in better risk-management practices and proper allocation and accounting of budget to optimize the reduction of crimes or any unwanted instances, as emphasized by Kelling (2009) in an article assessing the case of the Fire Department of New York.

Argona and Parcon (2004) adopt the hypothesis of Pyle that within general groups of crimes, deterrent effects differ quite substantially from one group to another. The researchers have tested the appropriateness of the theory in the Philippine setting. Identifying the right interventions to reduce a specific crime is premised on the relevance of Pyle's Theorem in the Philippine setting.

One of the benefits of a safe and secure environment is that it encourages investment and economic growth. The Philippine Development Plan (PDP) 2011-2016 recognizes this and therefore argues that crime reduction efforts pave way to promote and sustain public order and internal stability (SEPO, 2013). There is accumulating evidence that many prevention programmes are not only effective in reducing offending and victimization but are also cost-beneficial, resulting in considerable long-term savings, and bringing social and economic benefits well beyond reductions in crime (Shaw and Travers, 2007).

Identifying which interventions significantly contribute to the reduction of crime in the NCR police districts will help policymakers decide on which policies to focus on. These attempts have been made to improve community security throughout the NCR, and eventually throughout the country.

1.2 Scope and limitations

The main objective of this paper is to analyze the effects of eight interventions implemented by the National Capital Region Police Office (NCRPO) of the PNP to reduce robbery, theft, carjacking and “motorjacking” (for two-wheel vehicles), the four index crimes (crimes which are serious in nature and occur with high frequency) considered in the study. Using a panel data fixed effects analysis, the researchers investigate this relationship in each of the five police districts in NCR. The study is based on the data collected by the PNP-NCRPO, from the first week of January 2014 to the last week of September 2014.

The eight interventions included in the study are the following: (1) number of checkpoints per station conducted in the vicinity, (2) number of *Oplan bakal* operations per station conducted in the vicinity, (3) number of mobile patrol operations per station conducted in the vicinity, (4) number of beat patrol operations per station conducted in the vicinity, (5) number of warrants of arrest served, (6) number of *Oplan katok* operations per station conducted in the vicinity, (7) number of *Oplan bulabog* operations per station conducted in the vicinity, and (8) number of additional police personnel per station.

Weisburd et al. (2011) have noted that the clustering of crime at places is very important in criminological inquiry and practical crime prevention. Sherman and Weisburd (1995) support place-specific “micro-deterrence” effects of police policies in reducing crime. These researches provide the motivation to perform district-level analyses to capture the micro-deterrence effects of the interventions.

2. Review of Related Literature

In what follows, previous works related to crimes and interventions are reviewed. Included in this review are studies about the most prevalent crimes in the Philippines, trends in these crimes, and the interventions used to combat them. It also contains researches investigating the relationship between interventions and index crime incidence.

The Overseas Security Advisory Council (OSAC) identifies crime as a significant concern in urban areas of the Philippines (OSAC, 2014). According to the PNP Directorate for Investigation and Detective Management, crimes involving theft, physical assault, and robbery were the top three most common crimes reported to local authorities in 2013. Due to lack of response vehicles, radios, and other essential equipment, the PNP is limited in its capacity to respond and assist victims of crime.

Understanding the human sociological and behavioral condition facilitates the explanation of the reasons behind criminality. Pepa (2013) argues that, in the context of Philippine society, poverty and abuse of power are some of the causes of crimes. Very often, crimes are committed in areas where the urban poor live. Poverty may not strictly be identified as a direct cause of crimes, but certain circumstances that result from a situation of poverty can cause crimes. Another

major cause of crime in the country is the abuse of power by the people who hold position in the society (Pepa, 2013).

The National Crime Prevention Framework produced by Australian Institute of Criminology (AIC) in 2012 suggests that crime prevention strategies be directed towards:

- Addressing the environmental conditions that promote and sustain crime;
- Eliminating risk factors and enhancing protective factors to reduce the likelihood that individuals will engage in offending behavior;
- Strengthening communities by addressing social exclusion and promoting community cohesiveness; and
- Enhancing the capacity of criminal justice agencies to prevent crime and reoffending.

Urban crime prevention strategies include both social crime prevention and situational crime prevention policies. Social crime prevention measures are those which deal with the fundamental causes of crime or the criminogenic factors of crime. On the other hand, situational crime prevention measures, sometimes called defensive prevention measures, are those intended to reduce the opportunities for committing crime, attempting to increase the risk and difficulties of crime through environmental design and management (Sanidad-Leones, n.d.). Efforts done by the country's law enforcers can be divided into three main parts: (1) holistic system approach of the criminal justice system, (2) community-based policing system, and supplemented by (3) international technical cooperation projects (Sanidad-Leones, n.d.).

In this study, the crime prevention interventions examined are described. Two of these, the number of warrants served and number of additional police personnel, are, in a strict sense, not interventions. The former is a measure of the effectiveness of police service in ensuring the arrest of criminals, while the latter simply counts the number of additional police personnel deployed in the police districts. Nonetheless, these two, although not new operations conducted by the PNP, will still be referred to as "interventions." The definitions of the interventions given in this paper are from the PNP Standard Operating Procedures (SOP) in Managing Police Operations.

Police checkpoints

Checkpoints are important in maintaining public safety and reducing criminality in the streets. PNP (2015) describes checkpoints as "the conduct of at least 2 hours police check of vehicular and/or pedestrian traffic by at least 8-man complement in a place normally considered chokepoint or crime hotspot in order to enforce control measures, laws, ordinances and other regulations; police stations shall be required to organize a minimum of 3 teams and conduct simultaneous checkpoints within 8 or 12-hour shift." Moreover, checkpoints must

not cause inconvenience nor intimidate citizens. Instead, they should provide a real sense of safety and security (PNP, 2013).

Fell et al. (2008) and Lacey et al. (1999) assert that sobriety checkpoints not only result in arrests for the driving-while-intoxicated (DWI), but also yield apprehensions for stolen vehicles, illegal firearms, outstanding warrants, and drug violations (Fell, 2013). The strategy of using high-visibility traffic enforcement, where many drivers experience or see the enforcement activity (such as the use of sobriety checkpoints), apparently not only raises perceived probability of apprehension for the DWI, but may also raise the perceived risk of being arrested for other criminal activities (Fell, 2013).

Oplan Bakal operations

Oplan bakal operations are defined by PNP (2015) as the “conduct of spot checks on persons at bar joints and/or areas considered crime prone or hotspots in order to confiscate loose firearms and deadly weapons and prevent them from being used in crimes. It further aims to arrest or neutralize would-be motorcycle riding and walking criminals.”

Mobile patrols

A mobile patrol is described by PNP (2015) as “one or more police officers (usually 2 or buddy system) conducting patrol within designated sector using land based conveyance such as bicycles, motorcycles and motor vehicles in order to maintain order, prevent crimes and enforce laws and local ordinances. The number of operations shall be based on the number of mobile patrols per 8 or 12-hour shift.” Because of their increased efficiency of coverage, car patrols are sometimes preferred over foot patrols. However, some studies (e.g. Houghton Mifflin Harcourt, 2014) prefer foot patrols since car patrols reduce police contacts with citizens. There are three purposes of a patrol: to answer calls, to maintain police presence to deter crime, and to probe suspicious circumstances. Among these three, it is the second one, maintaining police presence, which is the most contentious. The argument for the importance of patrols is that police cars cruising randomly through city streets supposedly create the feeling that the police are everywhere.

Beat patrols

Police beats ensure that the policing needs of local areas are met with a service customized to each individual locality. PNP (2015) defines a beat patrol as “one or two police officers (usually 2 or buddy system) moving about on foot within the designated beat in order to maintain order, prevent crimes and enforce laws and local ordinances. The number of beat patrol operations shall be based on the given number of beats per 8 or 12-hour shift.” Beat policing is a strategy designed to make individual police officers responsible for the community’s policing needs

in a defined geographical area (Queensland Police, 2014). Beat patrols are also commonly known as “foot patrols.” The theoretical expectation of an increased police presence would be crime reductions as a result of an increase in perceived risk by offenders (Andresen and Malleon, 2014).

Number of warrants served

A warrant is a legal process issued by a competent authority, directing the arrest of a person or persons upon grounds stated therein (Philippine Law Library, 2015). In the first half of 2014, 562 warrants of arrest were served, resulting to the arrest of 410 suspects (Aquino Jr., 2014). Many studies have supported the “deterrence hypothesis,” or the idea that crime can be deterred if changes in the costs and benefits of crime are made. For example, Tittle and Rowe (1974) analyze certainty of arrest and crime data. Their study supports the deterrence argument as long as certainty of punishment reaches a critical level. Bailey (1976) also lends general support to the deterrence argument but shows that “the effect of arrest is not uniform for each offense, with different levels of arrest (certainty of apprehension) required to reduce rates for different crimes.”

Oplan Katok operations

Oplan Katok operations are defined by PNP (2015) as “physical verification and accounting of registered firearms through house visitation of known address indicated by the licensed firearm owners/holders. It aims to prevent or address the proliferation of loose firearms and ensures that the licensed firearm holders are residents of the addresses indicated in the data of Firearms and Explosives Office (FEO). Police stations shall be required to conduct a minimum of 40 “katok” operations or house visitations or verification of registered firearms per day.”

A number of house visitations have been conducted by the PNP as part of their effort to eliminate, as much as possible, the use of unlicensed firearms in criminal activities (Purisima, 2013). Many researchers have evinced the significant relationship between safe gun strategies and reduction of crimes (e.g. Sherman, et al., 1996; Kates, 1990). The security risk produced by irresponsible gun ownership and use is one of the major concerns of safe gun strategies.

Oplan Bulabog operations

The PNP (2015) defines Oplan Bulabog operations as the “conduct of saturation drive, spot checks and inspection at the barangays especially in crime prone places targeting unregistered, undocumented and stolen motorcycles.”

Number of additional police personnel

The analysis of Marvell and Moody (1996) affirms the hypothesis that the prevention benefits of hiring more police officers are greater in higher-crime cities than in places where crimes are less prevalent. One major theory about the

crime prevention benefits of hiring more officers is that it reduces police response time. The initial studies of the response time hypothesis produce strong evidence suggesting that a decrease in police response time could lead to the arrest of many more offenders.

Another major theory about the benefits of a larger police force is that it enables police officers to conduct more random patrols. The analysis of Koper (1995) of the Minneapolis Hot Spots Patrol data found a very strong relationship between the length of each police patrol presence (which averaged 14 minutes) and the amount of time the hot spot was free of crime after the police left the scene.

3. Coverage and Variables Used

The data on crimes and interventions come from the PNP National Capital Region Police Office (PNP-NCRPO). The data are given for each police station in all of the five police districts in NCR: Northern Police District (NPD), Eastern Police District (EPD), Manila Police District (MPD), Southern Police District (SPD), and the Quezon City Police District (QCPD).

Table 3.1 shows the police stations covered by the jurisdiction of each district. There are a total of 38 police stations involved in the study. Weekly data on the incidence of the index crimes and the interventions are collected from these police stations.

Table 3.1. PNP NCRPO Districts and Stations

District 1 NPD	District 2 EPD	District 3 MPD	District 4 SPD	District 5 QCPD
Caloocan Malabon Navotas Valenzuela	Marikina Pasig Mandaluyong San Juan	RaxaBago Tondo Sampaloc Sta. Cruz Ermita Sta. Ana J.A. Santos Sta. Mesa Malate Pandacan Meisic	Pasay Makati Paranaque Las Pinas Muntinlupa Taguig Pateros	La Loma Baler Talipapa Novaliches Lagro Batasan Cubao Project 4 Anonas Kamuning Galas Eastwood

Table 3.2 shows the index crimes involved in this study. The table also gives their definition and the way they are measured. These index crimes are the dependent variables in the negative binomial regression runs. The definitions are taken from Bragado (2007).

Table 3.2. Definitions of the Index Crimes Included in the Study

Crime	Definition	Measurement
Robbery	The intent to gain, take any personal property belonging to another, by means of violence or intimidation of any person, or using force upon anything.	Number of reported robbery cases per station
Theft	The intent to gain, take any personal property belonging to another without the consent or knowledge of the owner and without the use of violence against or intimidation of persons or force upon things.	Number of reported theft cases per station
Carnapping	The unlawful taking, with intent to gain, a four-wheel vehicle belonging to another without the latter's consent or by means of violence against or intimidation of person or using force upon things.	Number of reported carnapping cases per station
Motornapping	The unlawful taking, with intent to gain, a two-wheel vehicle belonging to another without the latter's consent or by means of violence against or intimidation of person or using force upon things.	Number of reported motornapping cases per station

Table 3.3 shows the labels and descriptions of the predictors, the eight interventions enacted by the PNP. These are the interventions being enforced by the PNP in its efforts to reduce the incidence of the index crimes.

Table 3.3. Description of the Interventions Enacted by the PNP

Interventions	Description
Police Checkpoints	Number of police checkpoints in station's vicinity
Oplan Bakal	Number of Oplan Bakal operations conducted in station's vicinity
Mobile patrols	Number of mobile patrol operations conducted in station's vicinity
Beat patrols	Number of beat patrol operations conducted in station's vicinity
Warrants served	Number of warrants served per station
Oplan Katok	Number of door-to-door visits in station's vicinity
Oplan Bulabog	Number of Oplan Bulabog operations conducted in station's vicinity
Additional Police	Number of additional police personnel per district/station

The dataset used in this research consists of weekly measurements collected by the PNP-NCRPO for all the 38 police stations in NCR. Since each police station is followed every week for a total of 39 weeks, the entire dataset is a panel dataset.

4. Methodology

The researchers use the fixed-effects negative binomial regression model for panel data to describe the effects of the interventions on the incidence of crimes. The model is introduced by Hausman et al. (1984), who first applied it to study the relationship between patents and R&D expenditures. Following the discussion of

Hausman et al. (1984), the parameter λ_{it} is assumed to follow a Gamma distribution with parameters γ_{it} and δ . Moreover, $\gamma_{it} = e^{X_{it}\beta}$ where X_{it} contains the measurements on the independent variables, and δ is a term common to all cross-sectional units and fixed across time periods. The mean and variance of λ_{it} are then $E(\lambda_{it}) = e^{X_{it}\beta}/\delta$ and $Var(\lambda_{it}) = e^{X_{it}\beta}/\delta^2$. Taking the Gamma distribution for λ_{it} and integrating by parts,

$$\begin{aligned} \Pr(n_{it}) &= \int_0^\infty \frac{1}{n_{it}!} e^{-\lambda_{it}} \lambda_{it}^{n_{it}} f(\lambda_{it}) d\lambda_{it} \\ &= \frac{\Gamma(\gamma_{it} + n_{it})}{\Gamma(\gamma_{it})\Gamma(n_{it} + 1)} \left(\frac{\delta}{1 + \delta}\right)^{\gamma_{it}} (1 + \delta)^{-n_{it}} \end{aligned}$$

which is the negative binomial distribution with parameters γ_{it} and δ . Hausman et al. (1984) mention that computation of maximum likelihood estimates with the use of partial fraction expansions of the gamma and digamma functions permits rapid evaluation. The moments of n_{it} are $E(n_{it}) = e^{X_{it}\beta}/\delta$ and $Var(n_{it}) = e^{X_{it}\beta}(1 + \delta) / \delta^2$. Thus, as Hausman et al. (1984) argue, the negative binomial specification allows for overdispersion (i.e., the variance can be greater than the mean), with the Poisson a limiting case as $\delta \rightarrow \infty$.

5. Descriptive Analysis

Table 5.1 shows the number of reported crime cases per district for the time period covered by the study: December 30, 2013 to September 28, 2014. Among the five police districts, it is the QCPD which has the highest incidence of robbery, theft, and carnapping, and the highest incidence of all crimes combined. The district with the highest incidence of motornapping is SPD. Moreover, it is noteworthy to look at the relatively low levels of crime in EPD and NPD, both for total crimes and for the index crimes considered individually.

**Table 5.1. Reported Incidence of Index Crimes by Police District:
December 30, 2013 to September 28, 2014**

	Robbery	Theft	Carnapping	Motornapping	Total
NPD	728	1,053	68	177	2,026
EPD	623	1,019	93	164	1,899
MPD	2,443	3,451	96	320	6,310
SPD	2,029	4,589	213	426	7,257
QCPD	3,066	5,543	308	256	9,173

Table 5.2 shows the number of operations for some of the interventions hypothesized to reduce the level of crime in the Metro Manila districts. It is SPD

which leads all other districts in number of checkpoints, Oplan Bakal operations, mobile patrols, beat patrols, number of warrants served, and Oplan Bulabog operations. Worth mentioning is the observation that SPD has more than twice as many Oplan Bakal operations, mobile patrols, and Oplan Bulabog operations, as that of any of the other districts. QCPD, on the other hand, has the highest number of Oplan Katok operations, more than twice that of the other districts.

**Table 5.2. Number of Operations for the Interventions:
June 16, 2014 to September 28, 2014**

	Checkpoint	Bakal	Mobile	Beat	Warrant	Katok	Bulabog
NPD	3,750	4,777	12,888	19,146	421	9,456	348
EPD	3,139	4,648	12,400	14,317	409	11,452	70
MPD	6,188	1,527	4,276	17,921	313	20,522	611
SPD	9,640	12,425	31,032	36,005	634	17,006	1,942
QCPD	5,883	5,455	13,734	17,782	89	50,550	392

Figures 5.1 to 5.5 show the weekly incidence of the index crimes for all of the five districts. The figures display the trends in these index crimes, enabling comparisons across the five police districts. The districts generally show dissimilar patterns of the movements of the index crimes across time. Some of the highlights of these patterns are now described. The dates for the weeks covered by the study are given in the Appendix.

Figure 5.1 shows the weekly incidence of crime in NPD. The graph shows that the incidence of theft has been steadily increasing, and so is the incidence of robbery, although at a slower rate. The incidence of carnapping and motornapping appear to show no increasing trend. In the recent weeks, however, the incidence of motornapping has been slowly on the rise. Figure 5.2 shows the weekly incidence of crime in EPD. Once again, the incidence of theft has been increasing, this time at an even sharper rate than what has been observed in NPD. The incidence of robbery is also generally rising. Lastly, the incidences of carnapping and motornapping both fluctuate at a low level. The movement of motornapping, however, is less stable.

Figure 5.3 gives the weekly incidence of crime in MPD. None of the index crimes show any obvious trend, although one might argue that the incidence of theft has been slowly increasing in the latter weeks. Moreover, the sizes of the fluctuations of all four series are roughly constant. Figure 5.4 gives the weekly incidence of crime in SPD. Except for motornapping, which can be seen as having an increasing trend, all other crimes display decreases in number in the latter weeks (something which can be seen through more careful inspection). Visible from the plots is the substantial drop in the levels of theft and robbery in recent

weeks. Lastly, Figure 5.5 shows the weekly incidence of crime in QCPD. Robbery, and motornapping do not display any trends. The incidence of theft, however, has been slowly increasing, while carnapping has steadily dropped.

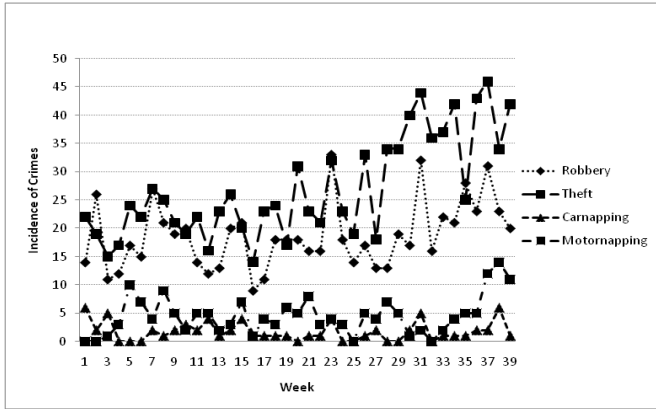


Figure 5.1. Weekly Incidence of Crime in Northern Police District: December 30, 2013 to September 28, 2014

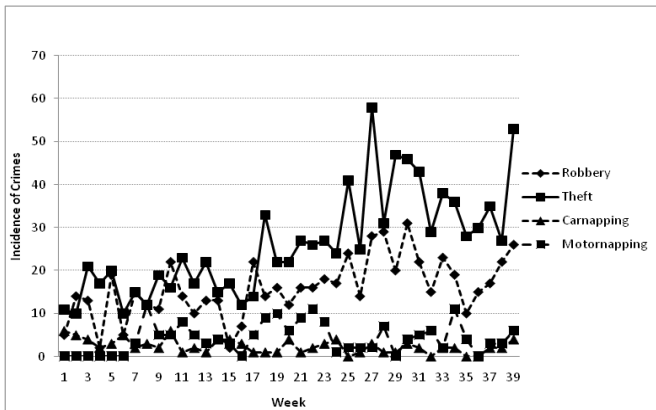


Figure 5.2. Weekly Incidence of Crime in Eastern Police District: December 30, 2013 to September 28, 2014

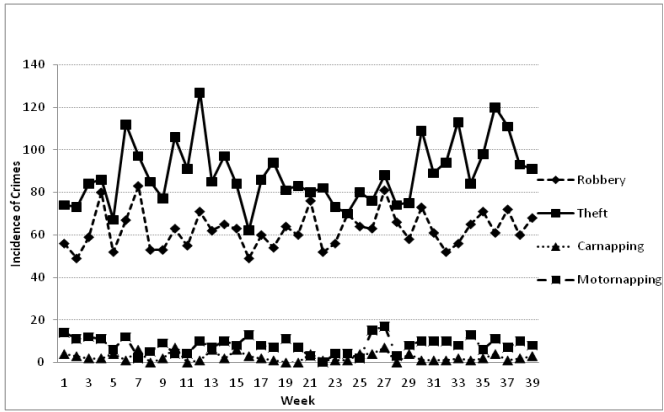


Figure 5.3. Weekly Incidence of Crime in Manila Police District: December 30, 2013 to September 28, 2014

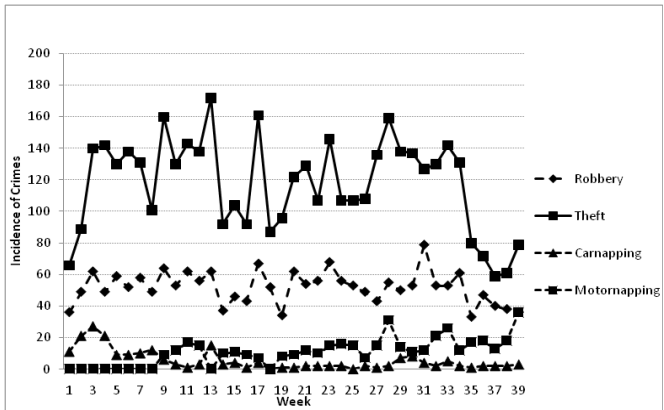


Figure 5.4. Weekly Incidence of Crime in Southern Police District: December 30, 2013 to September 28, 2014

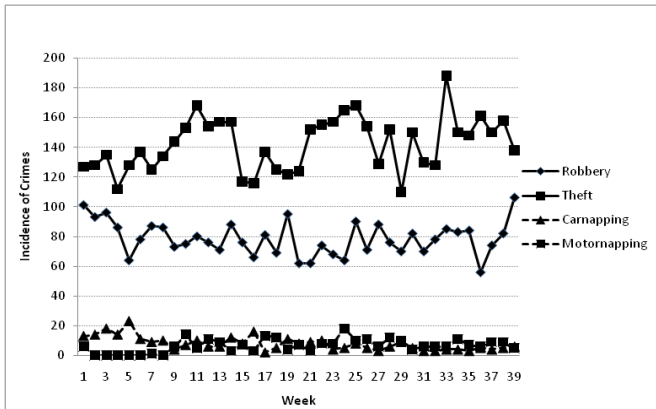


Figure 5.5. Weekly Incidence of Crime in Quezon City Police District: December 30, 2013 to September 28, 2014

6. Negative Binomial Regression Results

Tables 6.1 to 6.5 show the results of the fixed effects negative binomial regression runs for each of the five districts, with asterisks on those interventions which significantly decrease the level of crime. The standard errors of the estimates are enclosed in parentheses. The results of the regression run for NPD are shown in Table 6.1. The effect of mobile patrols is excluded because of multicollinearity issues. The table shows that the number of beat patrols is significant in bringing down the incidence of robbery and motornapping in NPD.

The results for EPD are given in Table 6.2. The results show that the number of mobile patrols is strongly significant in bringing down the level of motornapping in EPD. Meanwhile, the number of Oplan Bulabog operations is significant in reducing the incidence of robbery in EPD.

The results for MPD are shown in Table 6.3. Only the number of beat patrols appears to be significant in bringing down the incidence of crimes in MPD. In particular, it is significant in reducing the incidence of robbery. The SPD results, shown in Table 6.4, show that the number of Oplan Bakal operations, beat patrols, Oplan Katok operations, and additional policemen are significant in reducing some index crimes. In particular, the number of Oplan Bakal operations and beat patrols are significant depressants of robbery. On the other hand, the number of Oplan Katok operations and additional policemen are significant in reducing the incidence of theft.

Lastly, the results for QCPD are given in Table 6.5. The results show that the number of police checkpoints, Oplan bakal operations and mobile patrols are the interventions which are significant in bringing down the incidence of crimes. Increasing the number of police checkpoints brings down the incidence of motornapping, while Oplan Bakal operations and mobile patrols decrease the incidence of carnapping.

Table 6.1. Fixed Effects Negative Binomial Regression Results for Northern Police District

	Robbery	Theft	Carnapping	Motornapping
Police Checkpoints	0.00426 (0.00293)	0.00119 (0.00228)	0.01078 (0.01044)	0.00161 (0.00780)
Oplan Bakal	-0.00041 (0.00223)	0.00277 (0.00199)	0.00522 (0.00921)	0.01741 (0.00655)
Beat Patrols	-0.00159*** (0.00057)	-0.00026 (0.00048)	-0.00293 (0.00239)	-0.00467*** (0.00134)
Warrants Served	0.05573 (0.02251)	0.01946 (0.01898)	-0.07836 (0.10668)	0.00899 (0.04423)
Oplan Katok	-0.00026 (0.00048)	0.00021 (0.00040)	-0.00023 (0.00140)	-0.00004 (0.00117)
Oplan Bulabog	0.00515 (0.00500)	0.00266 (0.00410)	0.02454 (0.01426)	0.00093 (0.01166)
Additional Police	0.00409 (0.00219)	0.00275 (0.00204)	0.00666 (0.01105)	0.02437 (0.00533)
Constant	3.49297*** (0.89513)	2.76870*** (0.53095)	0.74874 (0.72349)	1.62805** (0.79262)

*Sig. at 10%; **Sig. at 5%; ***Sig. at 1%

Table 6.2. Fixed Effects Negative Binomial Regression Results for Eastern Police District

	Robbery	Theft	Carnapping	Motornapping
Police Checkpoints	0.00812 (0.00228)	0.00281 (0.00158)	0.00984 (0.00801)	0.01106 (0.00374)
Oplan Bakal	0.00121 (0.00173)	0.00279 (0.00129)	0.00161 (0.00537)	0.00171 (0.00343)
Mobile Patrols	0.00048 (0.00100)	0.00025 (0.00072)	-0.00534 (0.00441)	-0.01381*** (0.00336)
Beat Patrols	-0.00002 (0.00082)	0.00033 (0.00067)	0.00133 (0.00287)	0.00670 (0.00162)
Warrants Served	-0.00704 (0.01402)	0.00733 (0.00983)	-0.04329 (0.04804)	-0.00833 (0.03147)
Oplan Katok	-0.00015 (0.00053)	-0.00022 (0.00040)	-0.00135 (0.00185)	0.00367 (0.00110)
Oplan Bulabog	-0.12512** (0.05996)	-0.02061 (0.03528)	-0.07821 (0.19714)	0.03360 (0.07197)
Additional Police	0.00108 (0.00291)	0.00126 (0.00228)	0.01027 (0.00935)	0.01060 (0.00533)
Constant	1.47904*** (0.34145)	2.12561*** (0.33456)	0.37235 (0.49537)	-0.61740* (0.32189)

*Sig. at 10%; **Sig. at 5%; ***Sig. at 1%

Table 6.3. Fixed Effects Negative Binomial Regression Results for Manila Police District

	Robbery	Theft	Carnapping	Motornapping
Police Checkpoints	0.00357 (0.00158)	0.00280 (0.00150)	0.00667 (0.00759)	0.00477 (0.00421)
Oplan Bakal	0.00007 (0.00329)	0.00161 (0.00303)	-0.00240 (0.01647)	0.00571 (0.00807)
Mobile Patrols	0.00059 (0.00132)	0.00031 (0.00115)	0.00608 (0.00570)	-0.00437 (0.00411)
Beat Patrols	-0.00118** (0.00052)	0.00004 (0.00047)	-0.00146 (0.00291)	-0.00153 (0.00154)
Warrants Served	-0.00701 (0.00989)	-0.01434 (0.00968)	0.00608 (0.08197)	0.01851 (0.02466)
Oplan Katok	-0.00007 (0.00016)	0.00016 (0.00013)	-0.00189 (0.00181)	0.00027 (0.00030)
Oplan Bulabog	-0.00466 (0.00303)	-0.00352 (0.00245)	-0.03936 (0.05475)	0.00570 (0.00507)
Additional Police	0.00530 (0.00242)	0.00192 (0.00231)	0.00374 (0.01251)	0.00868 (0.00662)
Constant	3.14723*** (0.36233)	2.53232*** (0.19443)	1.05586 (1.02662)	0.60498* (0.31561)

*Sig. at 10%; **Sig. at 5%; ***Sig. at 1%

Table 6.4. Fixed Effects Negative Binomial Regression Results for Southern Police District

	Robbery	Theft	Carnapping	Motornapping
Police Checkpoints	0.00110 (0.00084)	0.00035 (0.00077)	-0.00004 (0.00300)	0.00169 (0.00182)
Oplan Bakal	-0.00106* (0.00062)	-0.00028 (0.00055)	-0.00049 (0.00281)	0.00333 (0.00168)
Mobile Patrols	0.00044 (0.00022)	0.00035 (0.00022)	-0.00161 (0.00112)	0.00131 (0.00055)
Beat Patrols	-0.00065** (0.00029)	-0.00026 (0.00027)	0.00036 (0.00134)	-0.00057 (0.00078)
Warrants Served	0.00791 (0.00798)	0.00864 (0.00739)	-0.01474 (0.04291)	0.00164 (0.02024)
Oplan Katok	0.00025 (0.00018)	-0.00038* (0.00022)	-0.00197 (0.00124)	0.00065 (0.00031)
Oplan Bulabog	0.00024 (0.00066)	0.00105 (0.00059)	0.00223 (0.00198)	0.00026 (0.00150)
Additional Police	-0.00243 (0.00176)	-0.00457** (0.00181)	0.00605 (0.00757)	-0.00440 (0.00400)
Constant	3.18544*** (0.35934)	2.37177*** (0.15410)	0.04901 (0.25021)	-0.10585 (0.22893)

*Sig. at 10%; **Sig. at 5%; ***Sig. at 1%

Table 6.5. Fixed Effects Negative Binomial Regression Results for Quezon City Police District

	Robbery	Theft	Carnapping	Motornapping
Police Checkpoints	0.00070 (0.00268)	0.00069 (0.00232)	0.01151 (0.00885)	-0.02513** (0.01056)
Oplan Bakal	0.00102 (0.00116)	0.00284 (0.00097)	-0.00909* (0.00537)	0.00557 (0.00366)
Mobile Patrols	-0.00062 (0.00113)	0.00002 (0.00100)	-0.00755* (0.00444)	0.01466 (0.00335)
Beat Patrols	-0.00028 (0.00072)	-0.00015 (0.00058)	-0.00291 (0.00286)	-0.00162 (0.00214)
Warrants Served	-0.03557 (0.05189)	-0.02191 (0.04223)	0.18790 (0.18911)	-0.20730 (0.16933)
Oplan Katok	0.00000 (0.00028)	-0.00003 (0.00023)	0.00040 (0.00101)	0.00086 (0.00100)
Oplan Bulabog	0.00906 (0.00708)	0.00503 (0.00615)	-0.00522 (0.03086)	0.01616 (0.01855)
Additional Police	-0.00049 (0.00107)	0.00016 (0.00088)	0.00302 (0.00426)	-0.00356 (0.00306)
Constant	3.11297*** (0.29726)	2.81419*** (0.16800)	0.66418** (0.29497)	-0.19719 (0.27784)

*Sig. at 10%; **Sig. at 5%; ***Sig. at 1%

7. Conclusions and Recommendations

There are index crimes in the NCR which display an increasing trend: slowly increasing in number since the start of 2014. The historical plots in Figures 5.1 to 5.5 show how the incidence of index crimes has changed over time. The incidence of theft has increased quite rapidly in NPD, while in the EPD its increase is even sharper. Robbery incidence has also increased gradually in these two districts. Moreover, the incidence of motornapping has steadily increased in SPD.

One of the efforts exerted by the PNP in improving the crime situation in the country is by enacting different interventions which this paper has described. Some of these interventions are effective in reducing certain crimes, while some are not. Moreover, the relationship between the crimes and interventions differs across the police districts. This paper has identified the interventions which bring down the level of crime in the different police districts in NCR.

The district-level results show that there is always at least one intervention which significantly decreases at least one of the index crimes considered: robbery, theft, carnapping and motornapping. In the NPD, results show that increasing beat patrols is effective in crime reduction, particularly the crimes of robbery and motornapping. Increases in the number of mobile patrols and Oplan Bulabog operations produce significant decreases in the respective levels of motornapping and robbery in the EPD.

In the MPD, increasing the number of beat patrols is the effective in reducing the incidence of robbery. In the SPD, Oplan Bakal, beat patrols, Oplan Katok, and addition of policemen all have significant diminishing effects on crime. Lastly, the number of police checkpoints, Oplan Bakal operations and mobile patrols are the effective interventions in Quezon City.

The results show that increasing the number of Oplan Bakal operations, beat patrols and Oplan Bulabog operations are those which significantly reduce the number of robbery cases. Oplan Katok operations and addition of policemen are the interventions which can lower the incidence of theft in SPD. The interventions which can bring down the level of carnapping are the Oplan Bakal operations and mobile patrols in QCPD. Lastly, the increasing the number of police checkpoints, mobile patrols and beat patrols reduce the incidence of motornapping.

References

- ANDRESEN, M. and MALLESON, N., 2014, Police Foot Patrol and Crime Displacement: A Local Analysis, *Journal of Contemporary of Criminal Justice* 30 (2) (May 2014), Sage Journals. Available at: <http://ccj.sagepub.com/content/30/2/186.full.pdf+html>.
- AUSTRALIAN INSTITUTE OF CRIMINOLOGY, 2012, National crime prevention framework, Australian Government. Available at: http://www.aic.gov.au/crime_community/crimeprevention/ncpf.html.
- AUSTRALIAN INSTITUTE OF CRIMINOLOGY, 2014, Crime prevention approaches, theory and mechanisms, Australian Government, Available at: http://www.aic.gov.au/publications/current%20series/rpp/100-120/rpp120/07_approaches.html.
- BAILEY, W.C., 1976, Certainty of arrest and crime rates for major felonies: A research note, *Journal of Research in Crime and Delinquency* 13(2): 145-154.
- BRAGADO, F., 2007, Fundamentals of criminal investigation, Philippines: Philippine College of Criminology Manila Law College Textbook Committee.
- FELL, J.C., 2013, The effects of increased traffic enforcement on other crime, *Proceedings of the 2013 Australasian Road Safety Research, Policing & Education Conference, Pacific Institute for Research and Evaluation*, Available at: <http://acrs.org.au/files/arsrpe/Paper%2029%20-%20Fell%20-%20Traffic%20Leg%20&%20Enforcement.pdf>
- FELL, J.C., TIPPETTS, A.S. and LEVY, M., 2008, Evaluation of seven publicized enforcement demonstration programs to reduce impaired driving: Georgia, Louisiana, Pennsylvania, Tennessee, Texas, Indiana, and Michigan, *Annals of Advances in Automotive Medicine*, National Center for Biotechnology Information, Available at: <http://www.ncbi.nlm.nih.gov/pubmed/19026220>.
- HAUSMAN, J., HALL, B. and GRILICHES, Z., 1984, Econometric models for count data with an application to the patents-R&D relationship, *Econometrica* 52 (4): 909-938.
- HOUGHTON MIFFLIN HARCOURT, 2014, Police strategies, *Cliffs Notes*, Available at: <http://www.cliffsnotes.com/more-subjects/criminal-justice/police-function/police-strategies>

- KATES, D.B., 1990, Guns, murders, and the constitution, Pacific Research Institute. Available at: <http://www.constitution.org/211/2ndschol/115kat.pdf>
- KELLING, G.L., 2009, How New York became safe: The full story, Special issue 2009, *City Journal*, Available at: http://www.city-journal.org/2009/nytom_ny-crime-decline.html
- KIUNISALA, R., GUIAM, R. and CABANLIT, E. JR., 2004, Crime prevention campaign and leadership styles of General Santos City police precinct chiefs: Their effects to crime rate, crime solution efficiency and community support and involvement, 9th National Convention on Statistics (NCS), National Statistical Coordination Board. Available at: http://www.nscb.gov.ph/ncs/9thncs/papers/publicOrder_CrimePrevention.pdf
- KOPER, C.S., 1995, Just enough police presence: Reducing crime and disorderly behavior by optimizing patrol time in crime hot spots, *Justice Quarterly*, Taylor and Francis Group. Available at: <http://www.tandfonline.com/doi/abs/10.1080/07418829500096231>
- LACEY, J. H., JONES, R. K. and SMITH, R. G., 1999, Evaluation of Checkpoint Tennessee: Tennessee's Statewide Sobriety Checkpoint Program, Technical Report, National Highway Traffic Safety Administration. Available at: <http://www.nhtsa.dot.gov/people/injury/research/ChkTenn/ChkptTN.html>.
- LATEST NEWS PHILIPPINES, 2013, 'Oplan Katok' yields thousands of loose guns. Available at: <http://latestnewsphilippines.com/national-news/oplan-katok-yields-thousands-of-loose-guns>.
- MARVELL, T.B. and MOODY, C. E., 1996, Specification problems, police levels, and crime rates, *Criminology* 34 (4): 609–646, Wiley Online Library. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1745-9125.1996.tb01221.x/abstract>
- Office of the President of the Philippines, 2014, PNoy cites declining crime incidence in Metro Manila, *Gov @ Work*, Philippine Law Library. Available at: http://president.gov.ph/gov_at_work/pnoy-cites-declining-crime-incidence-metro-manila.
- OVERSEAS SECURITY ADVISORY COUNCIL, 2014, Philippines 2014 crime and safety report. Available at: <https://www.osac.gov/pages/ContentReportDetails.aspx?cid=15294>.
- PEPA, R. F., 2013, The true state of the Philippines: Crime in a culture of corruption. Available at: <http://newsjunkiepost.com/2013/07/21/the-true-state-of-the-philippines-crime-in-a-culture-of-corruption>.
- PHILIPPINE NATIONAL POLICE, 2015, PNP Standard Operating Procedures (SOP) in Managing Police Operations.
- PHILIPPINE NATIONAL POLICE, 2013, PNP Guidebook on Human Rights Based-Policing. Available at: http://pnp.gov.ph/portal/images/stories/publicrelations/PHPNPGUIDEBOOK_opt.pdf
- PLANT, J.B. and SCOTT, M. S., 2009, *Effective Policing and Crime Prevention* 68: 133-150. Available at: <http://www.popcenter.org/library/reading/pdfs/mayorsguide.pdf>
- QUEENSLAND POLICE, 2014, Police Beats, State of Queensland (Queensland Police Service). Available at: https://www.police.qld.gov.au/programs/cscsp/p_beat
- SANIDAD-LEONES, C. V., n.d, The current situation of crime associated with urbanization: Problems experienced and countermeasures initiated in the Philippines. Available at: http://www.unafei.or.jp/english/pdf/RS_No68/No68_13VE_Leones1.pdf.
- SENATE ECONOMIC PLANNING OFFICE, 2013, Crime statistics at a Glance, Senate of the Philippines. Available at: <https://www.senate.gov.ph/publications/AAG%202013-05%20-%20Crime%20Statistics.pdf>.

- SHAW, M., and TRAVERS, K., 2007, Strategies and best practices in crime prevention in particular in relation to urban areas and youth at risk, *Proceedings of the Workshop held at the 11th UN Congress on Crime Prevention and Criminal Justice, International Centre for the Prevention of Crime*, Available at: http://www.crime-prevention-intl.org/fileadmin/user_upload/Publications/Strategies_and_Best_Practices_in_Crime_Prevention_urban_Areas_and_Youth_at_Risk_ANG.pdf.
- SHERMAN, L. W., SHAW, J. W. And ROGAN, D. P., 1995, The Kansas City gun experiment, *Research in Brief*, National Institute of Justice, US Department of Justice. Available at: <https://www.ncjrs.gov/pdffiles/kang.pdf>
- SHERMAN, L.W. and WEISBURD, D., 1995, General deterrent effects of police patrol in crime hot spots: A randomized, controlled trial, *Justice Quarterly* 12: 4, Center for Evidence-Based Crime Policy. Available at: <http://cebcp.org/wp-content/onepagere/ShermanWeisburd1995.pdf>.
- TITTLE, C.R. and ROWE, A.R., 1974, Certainty of arrest and crime rates: A further test of the deterrence hypothesis, *Social Forces* 52(4): 455-462.
- WEISBURD, D., GROFF, E. R. and SUE-MING, 2011, Understanding developmental crime trajectories at places: Social disorganization and opportunity perspectives at micro units of geography, Executive summary, United States Department of Justice. Available at: <https://www.ncjrs.gov/pdffiles1/nij/grants/236058.pdf>

**Appendix: Dates for the Weeks Covered by the Study:
December 30, 2013 to September 28, 2014**

Week	Date	Week	Date
1	December 30-January 5	21	May 19-25
2	January 6-12	22	May 26-June 1
3	January 13-19	23	June 2-8
4	January 20-26	24	June 9-15
5	January 27-February 2	25	June 16-22
6	February 3-9	26	June 23-29
7	February 10-16	27	June 30-July 6
8	February 17-23	28	July 7-13
9	February 24-March 2	29	July 14-20
10	March 3-9	30	July 21-27
11	March 10-16	31	July 28-August 3
12	March 17-23	32	August 4 -10
13	March 24-30	33	August 11-17
14	March 31-April 6	34	August 18-24
15	April 7-13	35	August 25-31
16	April 14-20	36	September 1-7
17	April 21-27	37	September 8-14
18	April 28-May 4	38	September 15-21
19	May 5 -11	39	September 22-28
20	May 12-18		