FUNDACIÓN IDEAS PARA LA PAZ

11

Working Papers


Police Reform, Training and Crime: Experimental evidence from Colombia's Plan Cuadrantes

Daniel Mejía
Daniel Ortega
Juan Felipe García

February 2013

Fundación **Ideas para la paz**

Police Reform, Training and Crime: Experimental evidence from Colombia's *Plan Cuadrantes*[*]

Reforma policial, entrenamiento y crimen: Evidencia experimental del Plan Cuadrantes en Colombia

Daniel Mejia[**]
Daniel Ortega[***]
Juan Felipe García[****]

Bogotá, February 2013
Serie Working papers FIP No. 11

---

[*] This project owes its existence to the openness and commitment to the generation of useful knowledge of the top leadership of the Colombian National Police, especially Gral. Jose R. León and to the hard work and dedication of the team of researchers at the Fundación Ideas para la Paz, particularly María Victoria Llorente, Patricia Bulla, Jerónimo Castillo, Hugo Frühling, Rodolfo Escobedo, Boris Ramírez, Juliana Esguerra, Humberto Martínez, Camila Molinos and Mónica Wills. The paper also benefited from suggestions from Jeffrey Grogger, Fabio Sánchez, Lawrence Sherman and seminar participants at the LACEA conference in Santiago, the AL CAPONE meeting at UC Berkeley, the Cambridge Center for Experimental Criminology at Cambridge University, UK, the 2012 American Society of Criminology Conference in Chicago and the LA Matters Workshop at the Harris School University of Chicago.

[**] Department of Economics and Research Center on Drugs and Security, Universidad de los Andes; email: dmejia@uniandes.edu.co

[***] Research Department, CAF and IESA; email: dortega@caf.com

[****] Research Fundación Ideas para la Paz; email: jgarcia@ideaspaz.org

Content

Police Reform, Training and Crime: Experimental evidence from Colombia's *Plan Cuadrantes**

5 Abstract

5 Resumen

6 1. Introduction

8 2. Colombia's Plan Cuadrantes

9 3. Related literature

10 4. Data description and experimental design

12 5. The effect of training on crime

15 6. What are the channels?

17 7. Concluding remarks

18 References

Abstract

The *Plan Nacional de Vigilancia Comunitaria por Cuadrantes* (PNVCC) is a new police patrolling program introduced in the eight major cities of Colombia in 2010 by the National Police. The strategy divides the largest cities into small geographical areas (*cuadrantes*), assigns six policemen to each, establishes a new patrolling protocol involving more community contact, and holds officers accountable for crime in their assigned area. The plan warranted a comprehensive training program for over 9.000 police officers aimed at improving interpersonal skills and implementation of the new patrolling protocols. By staggering the training schedule between three randomly chosen cohorts of police stations, we generate experimental variation in the exposure to training and in the effective implementation of the new police protocols induced by the Plan Cuadrantes. Comparing the 4 months immediately after training with the same months from the previous year, we find a significant reduction in several types of crime attributable to the training program, ranging from around .13 of a standard deviation for homicides to .18 of a standard deviation for brawls. These impacts are driven by very large effects in high crime areas and very small –or zero– effects in low crime neighborhoods. Once we take into account the high spatial concentration of crime, the estimated effects account for an overall reduction in the number of homicides of about 22%. We suggest that the training program affected crime by increasing the patrol police's sense of accountability to the population and also possibly through higher police motivation. Large efficiency gains in public service provision may be attainable with relatively inexpensive interventions that bring public servants closer to their clients.

Resumen

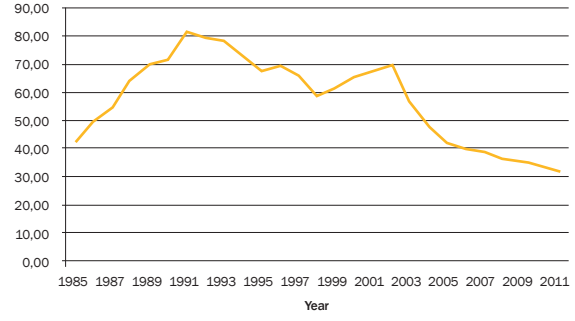
El *Plan Nacional de Vigilancia Comunitaria por Cuadrantes* (PNVCC) es un nuevo programa de vigilancia policial implementado por la Policía Nacional de Colombia en las ocho ciudades más grandes del país a partir del año 2010. Bajo esta nueva estrategia, se dividió cada ciudad en áreas geográficas pequeñas (cuadrantes), se asignaron seis policías a cada uno, se establecieron nuevos protocolos de vigilancia y patrullaje que involucran un mayor contacto con la comunidad y se hizo a los policías responsables por lo que pase en su cuadrante en materia de inseguridad. Bajo el nuevo Plan se desarrolló un amplio programa de capacitación para más de 9.000 policías, el cual se enfocó en mejorar su capacidad para implementar los nuevos protocolos de vigilancia del Plan Cuadrantes. El cronograma de capacitación se escalonó entre tres cohortes de estaciones escogidas de manera aleatoria, lo cual nos permitió generar variación experimental en la exposición al programa y en la efectiva implementación de éste. Al comparar los niveles de crimen de los cuatro (4) meses, luego de finalizada la capacitación con los de los mismos meses del año anterior, encontramos reducciones significativas y cuantitativamente importantes, las cuales son atribuibles al programa de capacitación. La reducción en los niveles de criminalidad va desde 0.13 desviaciones estándar (d.e.) para los homicidios hasta 0.18 d.e. para las riñas. Estos impactos son explicados por reducciones muy grandes en áreas con un alto nivel de crimen inicial y muy pocas reducciones –o nulas– en áreas con bajos niveles de crimen inicial. Una vez tenemos en cuenta la alta concentración especial del crimen, los efectos estimados explican una reducción agregada del nivel de homicidios del 22%. Nuestra interpretación de los resultados se basa en que el programa mejoró el sentido de responsabilidad de los policías con los ciudadanos y, posiblemente, su nivel de motivación. Nuestros resultados indican también que intervenciones que son relativamente poco costosas, pueden llevar a grandes ganancias de eficiencia en la provisión de servicios públicos (como la seguridad) cuando logran que los servidores públicos se sientan responsables de su labor ante la ciudadanía.

1. Introduction

Crime and violence impose heavy costs on society; lives lost, diminished labor market opportunities for injured victims, wasted resources in forcible exchanges of goods, private and public expenditures in security, among others. Given Latin America's discouraging leadership position in violent crime relative to other regions (UNODC, 2011), the magnitude of these costs are likely among the largest in the world[1]; correspondingly, the population have placed the issue at the top of their priority list (Latinobarometro, 2012). Colombia in particular, has suffered a long history of violence, to a good extent related to the drug trade[2], but also at times fed into itself in a perverse self-reinforcing dynamic (Gaviria, 2000). The evaluation of policing strategies to reduce crime are therefore of major importance in Latin America, and, to the best of our knowledge, this paper is the first controlled experimental evaluation of a police intervention in the region.

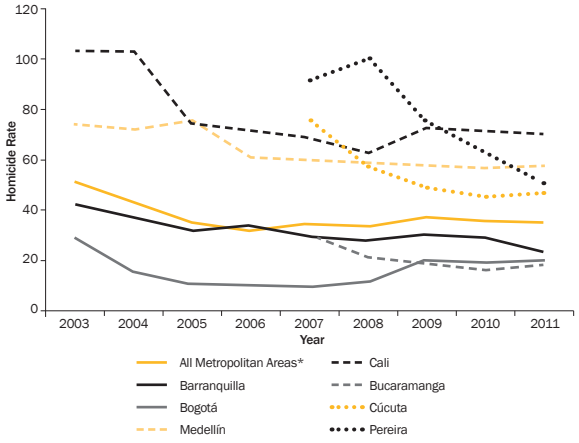
Colombia and its largest cities have gone through long and pronounced cycles of crime and violence during the last 30 years. The homicide rate in Colombia has historically been one of the highest in the world, with a declining tendency only in the last ten years, thanks in part to a massive Government led effort under the so-called *Plan Colombia* (Figure 1). In Medellín, for instance, the homicide rate peaked above 400 per 100,000 inhabitants in 1993, when the war against Pablo Escobar and his organization (the Medellín Cartel) was at its critical level. During the last 10 years, Medellín has seen large fluctuations in its levels of violence: the homicide rate went from over 100 in 2002 to about 30 in 2008, but after the extradition of Diego Fernando Murillo ("*Don Berna*") to the United States in May of 2008, a new cycle of violence erupted and the homicide rate went back up to over 60 within a period of just two years[3]. In Cali, the third largest city in Colombia, after a significant drop between 2004 and 2005, the homicide rate has remained relatively stable at around 70 homicides per 100,000 inhabitants, while Bogotá and Barranquilla have witnessed a slow decline in violence, although still at significantly high levels (Figure 2). So despite some progress, crime rates not associated with armed conflict but rather with urban-type phenomena such as burglaries, car theft, larceny theft, etc., still continue to be quite high, but have received less attention in the academic literature.

FIGURE 1 **HOMICIDE RATE IN COLOMBIA 1985 - 2011**



Source: Athors' calculations based on information from the Colombian National Police.

FIGURE 2 **HOMICIDE RATE IN THE FOUR LARGEST CITIES 2003–2011**



* The rate ia calculated only over the four largest Metropolitan Areas (Bogotá, Barranquilla, Cali and Medellín) betwen 2003-2006.

Source: Athors' calculations based on information from the Colombian National Police.

In July 2010 the Colombian National Police launched a new initiative that combined elements of community policing and problem-oriented policing, known as the *Plan Nacional de Vigilancia Comunitaria por Cuadrantes* ("Plan Cuadrantes"). This Plan is the key strategic response of the Colombian Government to its persistent urban crime problems, and seeks not only to transform the way in which

1 Although there is no agreed upon method for estimating the cost of crime, some estimates suggest the cost in Latin America is in the order of 14% of GDP, larger than estimates for other regions (Soares, 2006).

2 Mejia and Restrepo (2011) estimate that the homicide rate in Colombia would be 64% of what it currently is if the size of illegal drug markets hadn´t increased to the extent they did (110%) between 1994 and 2008. That is, it would be 23 per 100,000 inhabitants instead of 36.

3 Confrontations between criminal gangs over the control of the drug trafficking routes that "*Don Berna*" formerly controlled is the leading explanation for this recent increase (reference).

patrol policing is carried out in urban areas, but also to significantly improve the relationship of the police officer and the community.

This new initiative falls within the framework of police reforms introduced in different parts of the world during the last several decades and that became popular throughout Latin America since the 1990s (Fruhling, 2004). Many of these reforms have placed special emphasis on community policing as a way to improve police effectiveness both at prevention and repression of anti-social behavior (see Llorente et. al, 2011 and Fruhling, 2010). *Plan Cuadrantes* incorporates aspects of what is known as *problem oriented policing strategies*, where police services focus on quality diagnostics on the multiple causes associated with crime and then design tailor-made responses in order to prevent reoccurrence, instead of simply reacting to situations after the fact. A distinguishing characteristic of such strategies is concentrating the attention on those individuals, groups or locations that account for a disproportionate share of crime, working in conjunction with other government institutions and the community, collecting and analyzing information in order to diagnose the main problems, altering the environment in order to reduce the opportunities for crime to recur, and making use of alternative forms of social control in order to reduce crime (Goldstein, 1990).

The main objectives of the *Plan* are to improve operational strategies, exploit strategic complementarities with other units within the National Police, and increase the levels of collaboration with other State agencies and the community (Llorente et al., 2011). In order to evaluate the effects of the implementation of *Plan Cuadrantes* on the levels of crime and on community perceptions about the police, a team from the Fundación Ideas para la Paz (FIP) (a well-known Colombian think-tank specialized in security studies), in conjunction with the National Police, designed a comprehensive training program for over 9,000 police officers in order to improve their soft skills for effectively engaging the community within the protocols introduced under *Plan Cuadrantes*. In order to evaluate the causal impact of the implementation of the Plan on criminality levels, the Colombian National Police agreed to stagger the training schedule between three randomly chosen cohorts of police stations. With this, we were able to generate experimental variation in the exposure to training and in the effective implementation of the new policing protocols under the new *Plan*. When we compare the 4 months immediately after training with the equivalent months from the previous year, we find a significant reduction in several types of crime attributable to the training program, ranging from around 0.13 of a standard deviation for homicides and home burglaries to 0.18 of a standard deviation for brawls. These results seem to be largely driven by large reductions in high crime areas, while there seems to be almost no effect on those quadrants characterized by low initial levels of crime. In fact, once we take into account the high spatial concentration of crime, the training program accounts for a 22% reduction of the overall number of homicides. These large effects appear to be driven by an increased sense of accountability of the patrol police officer with the community she serves, and possibly by increased motivation and identification with the National Police as an institution.

These findings can have significant bearing on the debate on institutional strengthening of the public sector (Banerjee, et al., 2012), as it appears that simple and relatively inexpensive interventions such as the soft skills training program evaluated here can have sizable effects on the efficiency with which some public services are provided.

The paper is composed by six sections in addition to this introduction. In Section 2 we describe the building blocks of *Plan Cuadrantes*; section 3 describes the related literature and pinpoints the main contribution of this paper; in section 4 we describe the data used in the analysis and describe in detail the experimental design; section 5 presents the main results, while section 6 explores the possible channels through which the effects may be transmitted and section 7 concludes.

2. Colombia's Plan Cuadrantes

Under the new strategy, so far implemented in the eight largest cities in Colombia[4], each city was subdivided into small and well-defined geographical areas (*cuadrantes* – quadrants). A team, composed of street patrols of six policemen divided in three shifts (two policemen per shift), was assigned to each quadrant and held responsible for identifying the most pressing issues related to crime and insecurity, and for devising a strategy to intervene and reduce the levels of criminality. In order to fulfill these objectives, the Plan introduced new and specific protocols to provide the necessary tools for diagnosing the main security problems in the quadrant, make plans for intervening, and monitoring and evaluating the results of the intervention. More precisely, the new Plan induced a change from a purely reactive approach to crime (patrolling and responding when crimes occurred) to a more preventive approach that places special emphasis on identifying the key difficulties in the *cuadrante* and setting up protocols and working with the community in order to anticipate and prevent new crimes from occurring.

Thus, the new Plan has elements that lie at the intersection of problem-oriented policing and community policing. As such, *Plan Cuadrantes* introduced new operational tools and police tactics to the way in which the police runs its main activities every day. In practice, *Plan Cuadrantes* involves the deploying of street patrols to smaller geographical areas in order to guarantee the coverage of policing services in all areas of the city. The assigned units (patrols) are expected to plan their activities beginning with a diagnosis of the most pressing security issues in the quadrant, devise an intervention strategy in order to confront the problems and set up a system of indicators in order to follow-up on the results of the interventions. In order to operationalize these protocols, each team has to fill a form, known as the *minimum action required form* (Tabla de acciones mínimas requeridas – TAMIR) in order to help them plan their service, set the goals and follow up on the results of the intervention. At the technical infrastructure level, Plan Cuadrantes outfits each police station with a Strategic Information Center (Centro de Información Estratégica Policial Seccional – Sala CIEPS) that includes computing equipment with information on geo-coded criminal activity for all quadrants in the station, updated weekly.

At the managerial level, the *Plan* also induces adjustments in the way in which physical and human resources are allocated; in particular, the *Plan* guarantees that all city areas are covered by policing services. Furthermore, the Plan decentralizes strategic decisions by empowering the quadrants' patrols in the process of diagnosing the most pressing issues, planning the required interventions and following up on the evolution of criminal activities at the quadrant level.

[4] Bogotá, Medellín, Cali, Barranquilla, Cartagena, Bucaramanga, Pereira and Cúcuta.

3. Related literature

This paper is clearly within the literature on the effects of policing strategies on crime. This literature is plagued by endogeneity issues and confounding factors that have made it hard to reach strong conclusions about the causal effects of different types of interventions on crime. Summarizing the state of knowledge in this area, Weisburd and Eck (2004) conclude that "*knowledge of many of the core practices of American policing remains uncertain. Many tactics that are applied broadly throughout the United States have not been the subject of systematic police research nor have they been examined in the context of research designs that allow practitioners or policy makers to draw very strong conclusions*" (pp. 59 and 60). While there is very little evidence that supports the view that standard policing methods (random preventive patrolling, response to police calls for service, etc.) are effective in reducing crime and disorder, there is a growing body of evidence pointing out that geographically focused policing practices are effective strategies in the fight against crime. Also, recent evidence suggests that community policing practices implemented together with problem-oriented policing is an effective strategy for reducing crime and disorder (Weisburd and Eck, 2004 and Weisburd et al., 2008). On the one hand, community policing interventions rely on strong ties between police officers and the community, aimed at identifying crime problems and devising joint strategies to confront them. Under this policing strategy, the police can resort to a broad range of resources and methods to carry out its functions, such as working with NGOs and community groups to prevent teenagers and adolescents from getting involved in criminal activities (Goldstein, 1990; Weisburd, McElroy and Harddyman, 1988). Problem-oriented policing, on the other hand, is based on the premise that the police should focus its attention on a very specific set of problems and in designing and implementing tailor-made strategies to confront criminal phenomena (Goldstein, 1990). Another key element of problem-oriented policing strategies is that the police have to be proactive in the identification of the main problems that can potentially be targeted to reduce crime (Weisburd et al., 2008).

The core elements of *Plan Cuadrantes*, such as the requirement of a diagnosis of the main problems in each *cuadrante* before reacting, getting to know the key actors in the community (NGOs, schools, community leaders, etc.) and working together with them to confront the problems, and the focus on specific and well defined geographic areas suggests that it lies at the intersection of community policing and problem-oriented policing strategies.

Since the source of identification in this paper is the experimental variation in the timing of police training, this paper is also related to the literature on on-the-job training, which has focused largely on the productivity impacts of employee training in the private sector (Seyed-Mahmound, 2007). Here we evaluate a training intervention of public sector workers, and therefore contribute to understanding the effects of training on the provision of public services more generally, and on the quality of public institutions. In this respect, this paper is also closely related to Banerjee et al (2010) who experimentally assign 162 police stations in Rajasthan, India to four alternative treatments linked to institutional reform from "within"; one of these treatments was police training in soft skills, which had a positive impact on victim satisfaction and on crime reporting. The key differences between the Rajasthan experiment and the Colombian training experiment are, besides having only one dimension, the intensity of treatment (7 weeks versus 3 days), and the number of police officers experimentally assigned (9,000 in Colombia versus 1,500 in Rajasthan). In addition, the Colombian experiment covers 100% of police officers in every treated station (eventually all stations), while the Rajasthan study assigns 0, 25, 50, 75 or 100% of police officers in a station to treatment, leaving 12 out of the 162 stations as "pure" controls (7.4%) and 30 stations with zero trained personnel (18.5%); the analysis in this paper compares the 37% treated stations with 63% controls. By covering the eight largest cities in Colombia, this initiative bears on approximately 33% of the population of Colombia (31% if we exclude Cartagena).

4. Data description and experimental design

Most of the data used in this paper comes from official administrative records. We have police reports on 25 crimes and 25 contraventions, but choose to focus only on the three crimes that have the smallest reporting error: homicides, home burglaries and vehicle theft and on one additional crime that, while generally measured with significant error, is particularly likely to be affected by the program: brawls. Table 1 shows the average levels of each of these crimes (per 100,000 people) for the years 2010 and 2011 and for the seven cities included in the analysis. Cartagena (the eighth city) is excluded because the roll-out schedule of the training program was not implemented appropriately. Our analysis uses data at the level of the police station (the unit of randomization), since the data at the level of the *cuadrante* (1,419 in total) has significant measurement error due to imperfect geocoding that leaves out a significant number of crimes. The larger cities most often have higher levels of crime, with the exception of Cali, where homicide rates were the highest in the country in 2010 (Figure 2), and where vehicle theft seems to be worse than any other city. Contraventions such as brawls appear to be more of a small-city phenomenon. Overall, crime fell in Colombia between 2010 and 2011, and the goal of this paper is to quantify the effect of police reform under *Plan Cuadrantes*, and specifically the role that the police training program had in that decline.

As a key component of the implementation of the Plan, a training program was devised in order to develop the police force's readiness for the various tasks the reform involved; also, the training program made special emphasis on improving the soft skills they would need in order to effectively engage the community and to adequately coordinate with teams from other divisions inside the National Police or other state and city institutions. Given that the police trainers could not cover the entire patrol police (9,183 police officers as of May 2011) simultaneously, the evaluation team proposed a phased-in training schedule, constructing three randomly assigned cohorts of police stations in each city. There were 120 stations in total and 35% were assigned to the first cohort, 31% to the second and 34% to the third cohort. Since the city of Cartagena was excluded from the analysis due to implementation problems (12 stations), and population information is not available for a small group of rural stations in Bucaramanga and Cúcuta (3 stations) the resulting sample includes 105 stations with 39 in the first cohort, 32 in the second and 34 in the third cohort. We excluded the Tablaza station (randomly assigned to the first cohort) in Medellín from the estimations since it has a very small population of 1,050 inhabitants; the next station in that city is 11 times that size, so it does not have a reasonable pair-control within the city; in addition, due to its size, the calculated crime rates are very sensitive to small changes in crime; this leaves us with a total of 104 stations in the analysis. Figure 3 shows a timeline of the training program, which lasted 7 weeks for each cohort. The eight cities were divided into two groups, the first group, composed by Bogotá, Medellín, Cali and Barranquilla began training their first cohort in May 2011, while the second group of cities, composed by Cartagena, Cúcuta, Bucaramanga and Pereira began training their first cohort in July 2011. This is the reason why the total time span depicted in Figure 3 does not match exactly the sum of the training and work weeks. The

FIGURE 3 **TIMING OF THE TRAINING SCHEDULE FOR THREE COHORTS IN 8 CITIES**

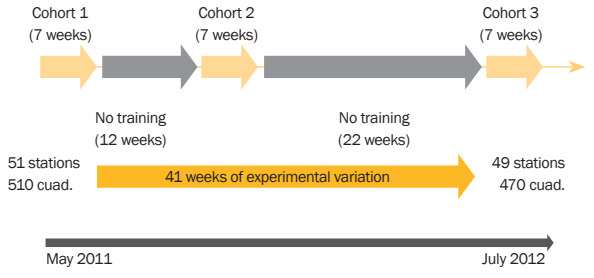


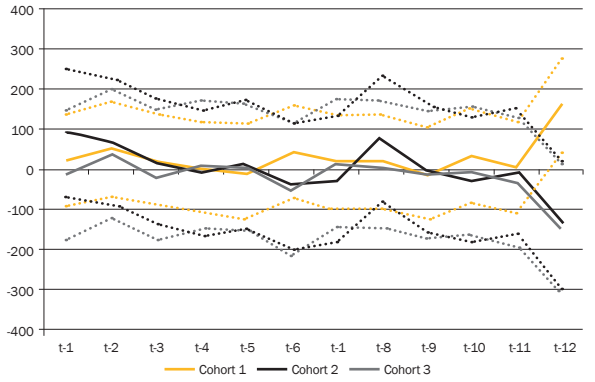
TABLE 1 **SCOPE AND SIZE OF THE PNVCC**

	Population	Stations	Cuadrantes	Cuadrantes / Station	Police officers	Population / Cuadrantes
Bogotá	7,347,795	19	768	40	4,610	9,567
Medellín	2,309,446	26	184	7	1,045	12,551
Cali	2,207,994	27	198	7	1,165	11,151
Barranquilla	1,182,493	12	93	8	520	12,715
Cartagena	899,200	14	85	6	528	10,579
Cúcuta	597,385	7	77	11	350	7,758
Bucaramanga	567,286	9	84	9	500	6,753
Pereira	383,623	6	81	14	465	4,736
TOTAL	15,495,222	120	1,570		9,183	

results presented here correspond to the analysis of the 4 months after training of the first cohort and just before the second cohort began its training. This is the time period for which the experiment is at its highest level of power, since, after this, the size of the control group is reduced by 29 stations[5]. Given the distribution of stations across cities and the quality of information in small cities with rural stations, out of the 104 stations included, 21 belong to the second group of smaller cities: 7 in Cúcuta, 6 in Pereira and 8 in Bucaramanga, so most of the results will be driven by impacts in the first group of larger cities.

Figure 4 shows the level of homicide rates for the three cohorts (all cities pooled together) for the 12 months prior to the beginning of training for the first cohort (May 2011 for the first group and July 2011 for the second group), and shows that, prior to the randomized intervention, the three groups showed no discernible differences in pre-treatment trends in monthly homicide rates. The analogous comparison for all other crimes studied here yields the same conclusion[6]. Other station-level ch aracteristics (personnel, area covered, etc.) showed no statistically significant difference across cohorts, confirming that the randomization at the station-level yielded valid comparison treatment and control groups[7].

FIGURE 4 **COMMON TRENDS IN HOMICIDE RATES BY COHORT IN THE 12 MONTHS PRIOR TO TREATMENT: TREATMENT VS. CONTROL GROUP (INCLUDES BOTH GROUPS OF CITIES)**



Note: Figure shows coefficients on monthly time lags for all cities setting t=0 the time when training began in each city, controlling for group mean and seasonal differences as well as group and cohort fixed effects (which were not significantly different from zero).

TABLE 2 **DESCRIPTIVE STATISTICS. CRIMES PER 100K PERSONS IN 2010 AND 2011**

	Homicides		Home burglaries		Vehicle theft		Brawls	
	2010	2011	2010	2011	2010	2011	2010	2011
Bogotá	52.0	66.3	288.4	238.7	352.9	199.3	178.6	252.2
Medellín	62.8	74.5	6.2	5.3	92.9	88.0	58.0	16.1
Cali	95.7	70.5	82.3	44.0	375.5	212.3	308.8	253.4
Barranquilla	52.7	47.7	36.3	33.7	130.5	80.5	234.4	258.1
Bucaramanga	23.0	20.9	129.3	199.9	44.0	30.0	532.2	368.8
Cúcuta	2.8	2.3	2.1	8.1	2.5	4.7	25.8	0.7
Pereira	9.4	13.8	25.2	29.8	3.4	4.2	0.0	0.0

Note: Figures are officially recorded 12-month average for each city-crime

[5] For these first four months, there is a larger imbalance between the size of treatment and control groups, but afterwards, the number of experimental units is much smaller. More precisely, $1/\sqrt{(.36(1-.36)98)}=.21$ for the first 4 months after training, and $1/\sqrt{(.52(1-.52)69)}=.24$, so the Minimum Detectable Effect increases (power decreases) by 14% after the second cohort begins its training.

[6] Available from the authors upon request.

[7] An F-test of the joint significance of station characteristics such as population, area and initial crime in a regression where the cohort is the dependent variable yields a p-value of .873, rejecting the joint significance of these variables in explaining the treatment.

5. The effect of training on crime

Although we are primarily interested in ascertaining the impact of Plan Cuadrantes, we first examine the reduced form effect of the training program on different types of crime and then determine whether any such impacts occurred through an improvement in the program's operation. Given the random assignment of police training, our empirical specification is a standard difference in differences model[8]. We estimate the following equation:

$$CRIME_{it} = \alpha + \beta_0 TRAINING_{it} + \gamma_t + \delta_i + \varepsilon_{it} \quad (1)$$

Where *i* indexes the station and *t* denotes the 4-month average in 2010 or 2011. We are also interested in understanding possible heterogeneous effects of police training, so we estimate equations of the form:

$$CRIME_{it} = \alpha + \beta_0 TRAINING_{it} + \sum_{t=1}^{j} \beta_t 1(QTILE_t) * TRAINING_{it} + \gamma_t + \delta_i + \varepsilon_{it} \quad (2)$$

Where $QTILE_t$ are quintiles of the 2010 distribution of crime rates. We also use a linear interaction of initial crime within the station when examining heterogeneous effects.

Tables 3 through 6 show our basic set of results using station-level data. The first three columns of each table refer to the four cities in group 1, and columns (4) - (6) include both groups of cities, although given the size of the smaller cities and the number for which we have data, these estimates are generally similar to those obtained for the large cities alone[9]. For ease of comparability across crimes and with other interventions, all coefficients are measured in standard deviations of the crime level before the training program was implemented (corresponding months in 2010). Column (4) of the tables show a negative effect of around 12.5% of a standard deviation in homicides, of around 7.5% of a standard deviation for vehicle theft and of about 18.6% of a standard deviation on brawls. For all these crimes, the average effect is not statistically significant, although economically the effects are sizable. Columns (2) and (5) report the direct effect of the training program but include an interaction of the program with the initial level of crime (e.g., the average crime rate in the corresponding months in 2010), and generally shows a negative and very statistically significant coefficient (except in the case of home burglary, where the effect is positive and statistically significant, but very small); in the case of homicide, vehicle theft and brawls, the average effect appears positive and significant. These patterns suggest the importance of considering a more flexible specification that allows for more non-linear

TABLE 3 **IMPACT OF POLICE TRAINING ON HOMICIDES RATES. STATION-LEVEL DATA**

	(1)	(2)	(3)	(4)	(5)	(6)
TRAINING * Y2011	-0.149 (0.101)	0.0994** (0.0480)	-0.00456 (0.172)	-0.125 (0.0830)	0.0871** (0.0418)	0.0171 (0.146)
TRAINING * Y2011 * Crime level in 2010		-0.00225*** (0.000127)			-0.00226*** (0.000123)	
TRAINING * Y2011 * Crime Quintile2			-0.0137 (0.229)			-0.0419 (0.189)
TRAINING * Y2011 * Crime Quintile3			-0.0425 (0.296)			-0.0499 (0.195)
TRAINING * Y2011 * Crime Quintile4			0.00738 (0.238)			-0.0327 (0.210)
TRAINING * Y2011 * Crime Quintile5			-0.594** (0.229)			-0.634*** (0.202)
Group of Cities	Gr 1	Gr 1	Gr 1	Gr 1 & 2	Gr 1 & 2	Gr 1 & 2
R-squared	0.031	0.804	0.144	0.022	0.774	0.143
Observations	166	166	166	208	208	208
Number of stations	83	83	83	104	104	104

Note: Statistically significantly different than zero at 99% (***), 95% (**), 90% (*) confidence. In all regressions the 2011 value is the four-month average immediately after the training is concluded and the 2010 value is the average of the same four months in 2010: July-October for group 1 and September-December for group 2. Cartagena is excluded as the training schedule was not implemented properly. All regressions include time and station fixed effects.

8 Given the small number of randomization units, it is likely that by pure chance some unobservable differences across stations, possibly correlated with crime, would persist across the treatment condition, thus our choice of a difference in difference model.

9 The specifications that include the second group of cities control for seasonal differences in crime rates between the first and second groups originating in the different training dates.

heterogeneous effects. Columns (3) and (6) in the tables include interactions of the program with indicators of quintiles of the distribution of each crime in 2010. For all crimes, there are large and very statistically significant negative effects of the training program on crime in the stations with the highest levels of initial crime (top 20%). Column (6) of the tables report a reduction of 0.63 standard deviations in the areas with the highest homicide rates, attributable to the training, a drop of 0.5 standard deviations in home burglary rates, a reduction of 0.81 standard deviations in vehicle thefts and a reduction of 1.44 standard deviations in brawls. There are essentially no impacts on any of the reported crimes at low incidence levels: the program impacted crime where crime was most prevalent. Notice that although not statistically significant, the absolute value of the coefficients generally increases as we move up the initial crime distribution.

When we look at results using data at the *cuadrante* level (not reported), the general pattern is essentially the same, although quantitatively slightly different due to the geocoding problem of crime reports at the *cuadrante* level. Again we find significant impacts in very high crime areas and essentially no impact in low-crime areas.

TABLE 4 **IMPACT OF POLICE TRAINING ON HOME BURGLARY RATES. STATION-LEVEL DATA**

	(1)	(2)	(3)	(4)	(5)	(6)
TRAINING * Y2011	0.0178 (0.0820)	-0.0697 (0.0820)	0.157 (0.212)	-0.000969 (0.0748)	-0.0737 (0.0780)	0.224 (0.183)
TRAINING * Y2011 * Crime level in 2010		0.000621*** (0.000190)			0.000509** (0.000197)	
TRAINING * Y2011 * Crime Quintile2			0.000799 (0.247)			-0.0399 (0.214)
TRAINING * Y2011 * Crime Quintile3			-0.0501 (0.247)			-0.142 (0.214)
TRAINING * Y2011 * Crime Quintile4			-0.247 (0.253)			-0.342 (0.223)
TRAINING * Y2011 * Crime Quintile5			-0.335 (0.247)			-0.502** (0.214)
Group of Cities	Gr 1	Gr 1	Gr 1	Gr 1 & 2	Gr 1 & 2	Gr 1 & 2
R-squared	0.163	0.262	0.211	0.242	0.289	0.317
Observations	166	166	166	208	208	208
Number of stations	83	83	83	104	104	104

Note: Statistically significantly different than zero at 99% (***), 95% (**), 90% (*) confidence. In all regressions the 2011 value is the four-month average immediately after the training is concluded and the 2010 value is the average of the same four months in 2010: July-October for group 1 and September-December for group 2. Cartagena is excluded as the training schedule was not implemented properly. All regressions include time and station fixed effects.

TABLE 5 **IMPACT OF POLICE TRAINING ON VEHICLE THEFTS. STATION-LEVEL DATA**

	(1)	(2)	(3)	(4)	(5)	(6)
TRAINING * Y2011	-0.0953 (0.110)	0.128* (0.0714)	0.195 (0.203)	-0.0751 (0.0896)	0.112* (0.0579)	0.190 (0.185)
TRAINING * Y2011 * Crime level in 2010		-0.000607*** (5.34e-05)			-0.000613*** (4.85e-05)	
TRAINING * Y2011 * Crime Quintile2			-0.0164 (0.254)			-0.0439 (0.215)
TRAINING * Y2011 * Crime Quintile3			-0.0868 (0.274)			-0.0981 (0.227)
TRAINING * Y2011 * Crime Quintile4			-0.160 (0.274)			-0.163 (0.267)
TRAINING * Y2011 * Crime Quintile5			-0.920*** (0.247)			-0.814*** (0.218)
Group of Cities	Gr 1	Gr 1	Gr 1	Gr 1 & 2	Gr 1 & 2	Gr 1 & 2
R-squared	0.248	0.712	0.424	0.218	0.697	0.383
Observations	166	166	166	208	208	208
Number of stations	83	83	83	104	104	104

Note: Statistically significantly different than zero at 99% (***), 95% (**), 90% (*) confidence. In all regressions the 2011 value is the four-month average immediately after the training is concluded and the 2010 value is the average of the same four months in 2010: July-October for group 1 and September-December for group 2. Cartagena is excluded as the training schedule was not implemented properly. All regressions include time and station fixed effects.

TABLE 6 **IMPACT OF POLICE TRAINING ON BRAWLS. STATION-LEVEL DATA**

	(1)	(2)	(3)	(4)	(5)	(6)
TRAINING * Y2011	-0.314 (0.195)	0.0414* (0.0224)	0.0240 (0.408)	-0.186 (0.163)	0.105* (0.0551)	0.0905 (0.317)
TRAINING * Y2011 * Crime level in 2010		-0.000239*** (3.01e-06)			-0.000239*** (8.32e-06)	
TRAINING * Y2011 * Crime Quintile2			0.00428 (0.493)			0.0126 (0.391)
TRAINING * Y2011 * Crime Quintile3			0.0335 (0.527)			0.00992 (0.429)
TRAINING * Y2011 * Crime Quintile4			-0.0347 (0.493)			-0.0576 (0.383)
TRAINING * Y2011 * Crime Quintile5			-1.443*** (0.493)			-1.443*** (0.413)
Group of Cities	Gr 1	Gr 1	Gr 1	Gr 1 & 2	Gr 1 & 2	Gr 1 & 2
R-squared	0.056	0.988	0.235	0.050	0.897	0.219
Observations	166	166	166	208	208	208
Number of stations	83	83	83	104	104	104

Note: Statistically significantly different than zero at 99% (***), 95% (**), 90% (*) confidence. In all regressions the 2011 value is the four-month average immediately after the training is concluded and the 2010 value is the average of the same four months in 2010: July-October for group 1 and September-December for group 2. Cartagena is excluded as the training schedule was not implemented properly. All regressions include time and station fixed effects.

Crime in Colombian cities is highly concentrated: in 2010, 45% of homicides occurred in the top quintile of the distribution of homicides, which makes the finding of a large impact in very high crime areas much more likely, and much more relevant. An effect size of 0.634 in the top quintile of the distribution of homicide rates implies a reduction of the homicide rate by 49% in that quintile. The combination of these two implies a reduction in the total number of homicides of around 22%, which by any standard is a very large effect (approximately 1,380 fewer homicides in total). These impacts suggest that police training increased police effectiveness in general, but the effect of this greater competence is only apparent where crime levels are high enough so that the impact is large relative to the average crime level.

6. What are the channels?

As part of the evaluation effort carried out by the FIP, a performance survey and a culture survey were conducted of police officers and higher ranked officials in order to ascertain the extent to which specific program protocols were being followed and whether police personnel's views about their job were being affected by the plan and by the training. Both of these surveys were conducted between November 2010 and February 2011, before the training program began and then a second round, between August and December 2011, after the first cohort finished its training. The performance survey generates 6 indicators at the station level that measure the extent to which police officers use the basic building blocks of *Plan Cuadrantes*: problem-solving orientation, complementarities with other units in the police, corresponsability, diagnosis and follow-up, training, and permanence. The culture survey measures police officers' views on issues like the importance of their relationship with the community, how accountable they feel towards it, the effort they exert in constructing their diagnosis, their orientation towards setting specific goals, the quality of their immediate work relationships and with other divisions and organizations and their general view of the quality of the *cuadrantes* strategy.

The training program was intended to improve the police officers' readiness and adaptation to the philosophy and protocols of *Plan Cuadrantes*, which in principle should be reflected in a differential improvement in the management indicators between trained and control stations. In order to assess the effects of the training program on the six building blocks of the *Plan* and on the indicators measured in the culture survey we estimate difference in difference type models as before. When looking at the average effect alone, the training program seems to have had very little effect on most management/implementation indicators (Table 7), with the exception of the indicator on external complementarities, which captures the extent to which police officers share information and resources with other operational agencies (criminal investigation, intelligence, etc.). The indicator is approximately 7% lower after training relative to the control group (statistically significant with 10% confidence). Maybe the effects on some of these implementation indicators require some time to materialize following training, but given the limitations of our experimental design, we are unable to capture any effects after the last cohort has entered the training program. We also examine whether these effects could have varied across stations with different levels of crime before the training began and found no differential effect across initial crime intensities (not reported).

The results using the culture survey (Table 8) provide a different story: overall, there seems to be very little impact of the training, except for the indicator on social accountability, which is 4% higher in the treatment group relative to the control (significant at 10% confidence), although, again, it is possible that some of the effects take a longer time to

TABLE 7 — **EFFECT OF THE TRAINING PROGRAM ON MANAGEMENT INDICATORS**

	(1)	(2)	(3)	(4)	(5)	(6)
	Diagnosis and follow-up	Internal complementarities	External complementarities	Permanence	Co-responsibility	Problem solving orientation
TRAINING * Y2011	-0.00674 (0.0440)	0.0340 (0.0379)	-0.0716* (0.0406)	-0.0200 (0.0376)	-0.0395 (0.0386)	0.0240 (0.0363)
Y2011	0.327*** (0.0383)	-0.0144 (0.0330)	0.164*** (0.0354)	0.244*** (0.0328)	0.0904*** (0.0336)	0.0110 (0.0316)
Observations	312	312	312	312	312	312
R-squared	0.372	0.004	0.104	0.296	0.038	0.007
Number of stations	104	104	104	104	104	104

Note: Statistically significantly different than zero at 99%(***), 95%(**), 90%(*) confidence. All regressions include station-level fixed effects.

TABLE 8 — **EFFECT OF THE TRAINING PROGRAM ON "CULTURE" MEASURES**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Relationship with community	Social accountability	Diagnostic effort	Specific goal orientation	Internal work relations	Inter-department relations	Relations with other entities	Quality of the PNVCC
TRAINING * Y2011	-0.0193 (0.0296)	0.0425* (0.0242)	0.0215 (0.0273)	0.0423 (0.0344)	0.0182 (0.0447)	0.0561 (0.0579)	0.0296 (0.0385)	0.0155 (0.0445)
Y2011	0.0129 (0.0236)	-0.0714*** (0.0193)	-0.0420* (0.0217)	-0.0496* (0.0274)	-0.0286 (0.0356)	-0.112** (0.0462)	-0.128*** (0.0307)	0.0261 (0.0354)
Observations	179	179	179	179	179	179	179	179
R-squared	0.005	0.174	0.060	0.039	0.010	0.093	0.296	0.034
Number of stations	94	94	94	94	94	94	94	94

Note: Statistically significantly different than zero at 99%(***), 95%(**), 90%(*) confidence. All regressions include station-level fixed effects.

materialize, and can't be identified in this experiment. The fact that the training program emphasized soft skills for improving the police's relationship with the community, we expect a higher quality relationship of the patrol police officer with the community, perhaps police officers spend more time with the community as a consequence of the training, and possibly as a result of that interaction, have felt more accountable to the population in the provision of a more effective security service. It seems plausible that this sort of interaction could lead to more effective provision of other public services as well. Finally, police training may have had an effect on crime through a motivational channel, in addition to the elements more closely linked to the content of the training. As was remarked on before, beyond the police academy, patrol police officers rarely receive any additional training, and this was the first time they received a training program on soft skill development such as teamwork, leadership or negotiation skills. Informal conversations with patrol police officers suggest they were very positively impressed with the initiative and in general felt a higher sense of duty and belonging to the Institution after training, which they viewed as an act of recognition and appreciation by the police's top leadership.

7. Concluding remarks

This paper shows that a simple and inexpensive training intervention focused on the quality of the relationship between the police and their community can go a significant way in improving citizen security indicators. The training program appears to have reduced the police's perceived barriers to communication with the community, and thus increased the police officer's sense of accountability towards the population in their *cuadrante*. In addition, the training program may also have affected the patrol police's motivation and sense of belonging to the National Police, which of course may be related to the first channel. The fact that the estimated impact is so sizable in high crime areas suggests that it is possible to make significant efficiency gains in the provision of public services with relatively little resources. Our estimates suggest this intervention may be attributed to a 22% drop in the number of homicides in the 7 cities included in the experimental study.

Certainly, there is no guarantee that a patrol police training program in other countries such as Guatemala or Venezuela would yield such large effects for many reasons, including the professionalism and institutional structure of the Colombian police, but most importantly, the fact that the training was conducted within the context of a complete revamping of police patrolling protocols under the *Plan Cuadrantes*. Insofar as the elements that have been shown to have an impact on crime as a consequence of the training are an integral part of the community policing aspect of the Plan, our results can be interpreted as a positive impact evaluation of the plan itself.

Another potentially important part of the impact of the Plan is the change in the police deployment scheme. By dividing the territory in to small areas –*cuadrantes*– and assigning six police officers to each, it is possible that previously under-patrolled high crime areas witnessed an increase in police presence and a subsequent reduction in crime as a consequence. This does not affect our evaluation strategy since the deployment scheme is common to all areas in treatment and control stations. However, if there are economies of scale in community policing, whereby an increase in the number of patrol police makes establishing a relationship with the community less costly for each individually, it is possible that the estimated effects would be smaller in places where police presence didn't increase. We don't have data on patrolling routes or police presence across areas within cities before and after the implementation of the Plan, but related research in other contexts suggests that the allocation of police resources may not respond to crime as much as it does to socioeconomic status[10]; the more politically active and better-off households receiving a higher share of police protection (Behrman and Craig, 1987).

Finally, this research highlights the importance of conducting further similar randomized trials in other contexts where public servants may be under appreciated and where their sense of social responsibility may be lacking. There is a literature suggesting that such efficiency gains in public service may invite a form of reciprocal behavior from the population, which may translate into an increased willingness to pay taxes (Ortega, Ronconi and Sanguinetti, 2012).

[10] One of the authors of this paper has ongoing research on the allocation of police presence across neighborhoods in Caracas, which shows that police presence in wealthy neighborhoods is double that in poorer neighborhoods, despite the fact that the homicide rate is more than 3 times higher in poor areas compared to the wealthier ones.

References

Banerjee, A., R. Chattopadhyay, E. Duflo, D. Keniston and N. Singh (2012) "Can Institutions be Reformed from Within? Evidence from a Randomized Experiment with the Rajasthan Police" NBER WP # 17912.

Behrman, J. and S. Craig (1987) "The Distribution of Public Services: An Exploration of Local Governmental Preferences" American Economic Review, Vol. 77 No. 1, pp. 37-49.

Carrasco, V., De Mello J., and Mejia, D. (2011) " Collusion, Price Competition and Inter-gang Violence". Mimeo PUC-Rio.

Gaviria, A. (2000) "Increasing returns and the evolution of violent crime: the case of Colombia" Journal of Development Economics. Vol 61, pp. 1-25.

Goldstein, H. (1990) *Problem-oriented Policing*. University of Wisconsin-Madisson, Mc-Graw Hill International.

Lessing, B. (2011) "The Logic of Violence in Drug Wars" Mimeo, University of California, Berkeley.

Fruhling, H. (2004) *Calles más seguras: estudios de policía comunitaria en América Latina*. Inter-American Development Bank.

Llorente, M., Bulla, P. and Castillo J. (2011) "Seguimiento y evaluación de impacto del Plan Nacional de Vigilancia Comunitaria por Cuadrantes de la Policía Nacional de Colombia". In Experiencias en América Latina: El desafío de evaluar programas de seguridad ciudadana, Instituto de Asuntos Públicos, Centro de Estudios en Seguridad Ciudadana, Universidad de Chile, pp. 23–30.

Ortega, D., L. Ronconi and P. Sanguinetti (2012) "Reciprocity and willingness to pay taxes: evidence from a survey experiment in Latin America" CAF Working Paper # 2012/01.

Seyed-Mahmoud Aghazadeh, (2007) "Re-examining the training side of productivity improvement: evidence from service sector", International Journal of Productivity and Performance Management, Vol. 56 Iss: 8, pp.744–757.

Soares, R. (2006) "Welfare Costs of Crime and Common Violence: A Critical Review" PUC Rio Working Paper No. 581.

UNODC (2011) "2011 Global Study on Homicide". United Nations Office on Drugs and Crime, Vienna.

Weisburd, D., McElroy, J., and Hardyman, P. (1988) "Challenges to Supervision in Community Policing: Observations on a pilot project." American Journal of Police 7(2), pp. 29-50.

Weisburd, D. and Eck, J. (2004) "What Can Police Do to Reduce Crime, Disorder and Fear". The Annals of the American Academy, 593, May, pp. 42-65.

Weisburd, D., Telep, C., Hinkle, J., and Eck, J. (2008) "The Effects of Problem-Oriented Policing on Crime and Disorder" Campbell Collaboration systematic review.

Texts
FUNDACIÓN IDEAS PARA LA PAZ

Photographs
Revista Semana y archivo FIP

Layout
David Rendón

ISSN: 1909-4310

Fundación Ideas para la Paz (FIP)
Calle 100 No. 8ª – 37 Torre A. Of. 305. Bogotá
Tel. (57-1) 218 3449
www.ideaspaz.org / e-mail: fip@ideaspaz.org

La Fundación Ideas para la Paz (FIP) es un centro de pensamiento creado en 1999 por un grupo de empresarios colombianos. Su misión es generar conocimiento de manera objetiva y proponer iniciativas que contribuyan a la superación del conflicto armado en Colombia y a la construcción de una paz sostenible, desde el respeto por los derechos humanos, la pluralidad y la preeminencia de lo público. La FIP, con independencia, se ha propuesto como tarea central contribuir de manera eficaz a la comprensión de todos los escenarios que surgen de los conflictos en Colombia, en particular desde sus dimensiones política, social y militar. Como centro de pensamiento mantiene la convicción de que el conflicto colombiano necesariamente concluirá con una negociación o una serie de negociaciones de paz que requerirán la debida preparación y asistencia técnica. Como parte de su razón de ser llama la atención sobre la importancia de preparar al país para escenarios de postconflicto.

FUNDACIÓN IDEAS PARA LA PAZ
Tel: (57-1) 218 3449
Calle 100 No. 8A-37, Torre A, Oficina 305
www.ideaspaz.org / e-mail: fip@ideaspaz.org