

# THE SOCIAL COSTS OF CRIME IN MEXICO CITY AND SUBURBAN AREAS

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*Resumen:* Realizamos mediciones del costo social del crimen. Primero estimamos el costo de los homicidios a nivel nacional para 1997, bajo distintos supuestos acerca del perfil de salarios, y obtuvimos de .03 a .6 por ciento del PIB, dependiendo del factor de descuento utilizado. Segundo, contemplamos otros tipos de violencia para estimar los costos sociales del crimen en la ciudad de México, los cuales ascendieron a 3.6 por ciento del PIB de la ciudad, el cual consideramos subestima los verdaderos costos. Contar con información sobre no víctimas sería muy valioso para continuar investigando sobre el tema.

*Abstract:* In this paper we measure social costs of crime, following two approaches. First, estimate costs of homicides, at the National level in 1997, under different assumptions about lost wages. When assuming profiles differ over the life cycle, the costs amount from .03 to .6 percent of GDP, depending on the discount factor. Second, we take into consideration other types of crime to estimate social costs of crime in Mexico City. We found costs approximate 3.6 percent of the City's GDP, but consider this figure a lower bound. Further data including costs borne by non-victims would be most helpful for further research in this field.

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## 1. Introduction

The social costs that arise from crime have been previously analyzed and estimated in several studies, especially in the United States (Freeman 1996). Most of these studies suggest different methodologies for eliciting sound estimates of social costs and come to impressive results regarding their dimension. However, very little has been done to assess the distributional consequences of crime on the socio-economic status of the individuals.

In this paper we first approximate one dimension of the social costs of crime for the country as a whole. Due to data limitations, we only use aggregate, officially reported homicide rates as an indicator of the social costs of crime. While it is true that the social costs of crime are composed of many factors,<sup>1</sup> this is only an approximation, perhaps a lower bound. However, to obtain a better order of magnitude of the social costs of crime, we use a victimization survey collected in the Mexico City area that is well suited for more complete indicators the costs individuals bear when they experience a crime. We calculate both monetary and non-monetary costs of crime.

We find, first, that the social costs of crime attributed to losses of lives due to homicides in 1997 amounts to between .03 to .6 percent of Mexican GDP, when we take into consideration different wage profiles for the life cycle, depending on assumptions about the discount factor. Second, figures that do not take into account differences in wage profiles over time, severely underestimate the costs that can be attributed to homicides. Third, we find that the social costs of crime and crime prevention in Mexico City in 1999 approximate 6 percent of the City's GDP in 1998. Moreover, when the value of property transfers attributable to robbery and larceny theft is taken into account, victimization costs rise to over 10 percent of the City's GDP. Fourth, we find that the impact of these costs is higher in the lowest quintiles of income. Poor people in Mexico City constitute the vulnerable group toward which public policy should be oriented.

## 2. Review of the Literature on Crime

The economic literature on the subject of crime and violence can be traced back to the late sixties, when Becker (1968) first addressed,

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<sup>1</sup> Buvinic, Morrison and Shifter (1999) categorize the social costs that can be attributed to crime into direct costs, non-monetary costs, economic multiplier effect and social multiplier effects.

from a theoretical approach, the question of what leads individuals to choose to perform criminal activities over “lawful” ones. Following Becker’s contribution, most of the economic literature regarding crime and violence has focused on the determinants of crime and their relationship with economic variables. This literature is especially rich in studies for the United States. According to these studies, the most important economic determinant of changes over time in the crime rate seems to be changes in labor market conditions, including the evolution of wages, unemployment, and also changes in income inequality. These seem to affect, substantially, the benefits relative to costs of undertaking criminal activities.

Some of the most recent research is that of Mocan and Rees (1999), who find that both an increase in local unemployment and local poverty increase the propensity of juveniles to commit crimes. Likewise, Grogger (1997) finds that youths are particularly responsive to price incentives, which suggests that reductions in real wages are an important explanation of the observed increase in youth crime. In addition, Witte and Tauchen (1994) encounter that schooling and work significantly decrease the probability of committing criminal acts in a cohort sample of young men. Freeman (1994, 1996) suggests that an increase in income inequality and particularly a decrease in the real earnings of the less educated can lead to increases in the propensity to commit crime. On the other hand, and against general expectations, Witt and Witte (1998) find that not only are higher levels of imprisonment in the United States related to significantly higher crime rates, but that increases in labor participation of women have an even stronger impact on crime than that of imprisonment.

Fajnzylber, Lederman and Loayza (FLL, 1998) undertake an analysis of the determinants of intentional homicide rates using an unbalanced panel of countries. They find that the rate of growth of GDP has a negative and significant relationship with homicide rates, while Gini coefficients and dummies for drug producing countries have positive and significant effects on homicide rates. They also find that there is a positive (but weak) association between an increase in the average school years of the population and a decrease in homicide rates. Other studies encounter that violence is related to accelerated economic growth, stating that poverty and inequality in the distribution of income are often associated with high crime rates under contexts of demographic changes, urbanization and industrialization (Sampson and Lauritsen, 1994). Regarding the differences in crime rates between urban and rural areas, Gleaser, Sacerdote and Scheinkman (1996) find that they are significantly explained by observable char-

acteristics of individuals and cities, especially by those characteristics that reflect tastes, social influences and family structure.

In an earlier paper, Glaeser and Sacerdote (1995) had already found that the amount of social interactions in cities can explain the high cross-city variance of crime rates. Social interactions are high in petty crimes (such as larceny and auto-theft), moderate in more serious crimes (such as burglary and robbery) and almost nonexistent in homicide and rape. Lederman, Loayza and Menéndez (1999) also found that social capital, measured as trust in community members, has the effect of reducing the incidence of violent crimes. However, other measures of social capital had no significance when explaining differences in crime rates.

Research on the causes of crime for Mexico is scarcer. Several books have been written on the subject of crime in Mexico and the considerable increase that has taken place in the last two decades. However, the statistical analysis employed is, generally, limited to aggregate nation-wide statistics, or to the increase in crime rates in a couple of large cities, and, within these, mostly of Mexico City. Related to this, an important effort has been made by the Citizen's Institute for the Study of Insecurity, (ICESI). During 2001 and 2002 respectively, this organization fielded the first and second National Surveys of Insecurity. Results from these surveys characterize crime in Mexico, with respect to incidence, type of crime, reporting and value of losses. While Ruiz Harrel (1998) finds that changes in economic activity are important in explaining crime, the study by *Instituto Mexicano de Estudios de la Criminalidad Organizada*, IMECO (1998), argues that other factors, such as drug dealing, are more important.

More recently, Messmacher (2000) finds, through a very similar approach to that used by FLL (1998), that the 1995 crisis in Mexico had a strong effect on the increase of homicide rates. According to Messmacher's study, an increase in the rate of growth of employment has a negative effect on the homicide rate, even larger than that of an increase in the growth of GDP, suggesting that the effect of the crisis on homicides acted through events in labor markets.

The consequences of crime and violence in terms of social costs have definitely received less attention by such a large literature. The consequences of crime are, however, as important as its causes if one wants to understand the crime phenomenon well enough to design public policies aimed at its reduction. Violence and crime cause serious monetary and non-monetary losses to individuals and societies in general. There is general agreement that monetary costs refer to those of controlling criminality -a cost that is usually born by the whole so-

ciety, through governmental expenditure; spending on self-protection; and the costs of recovering from the losses, as well as opportunity costs of time, and medical expenses. Non-monetary costs are generally attributed to the social costs of losing lives to homicides, as well as to the costs associated with losses in the quality of life, such as the costs of pain and fear and those associated with behavioral changes before or after being a victim of crime. Monetary and non-monetary costs of crime and violence are difficult to estimate for the vast majority of countries. Especially in Mexico and other Latin American countries, official crime data are often scarce and, when they exist, not always reliable (Mexican Health Foundation (FUNSALUD) and World Bank, 1999).

The literature for the United States has only recently addressed this issue. Miller, Cohen and Rossman (1993) calculate the monetary costs of crime (medical bills, property loss and lost productivity) and reductions in the quality of life attributable to pain and suffering. They calculate jury awards in civil suits, excluding punitive damage, for a wide range of crime categories. According to their estimates, the cost per murder in 1993 was over \$2.7 million, of which \$700,000 was for lost productivity.<sup>2</sup> In 1996, Cohen, Miller and Wiersema (CMW, 1996) estimated that crime generated a total loss of \$450 billion annually. This estimation included property and productivity losses, outlays for medical expenses, values of pain, long-term emotional trauma, disability and the risk of death. However, the confidence intervals of most of their estimates are so large that the estimates are statistically insignificant.<sup>3</sup> More recently, Bourguignon (1998), based on Freeman (1996), calculated that the cost of crime in the US in 1995 was equivalent to 3.7% of that year's GDP.

In Latin America, the study by the ICESI (2002) on violence in Mexico estimated the costs attributable to crime and found that, on average, these losses are equal to \$13,245 pesos per victim in 2001, or 0.85 percent of GDP in sum. Unfortunately the methodology used to arrive to this estimate is not provided.

Londoño and Guerrero (LG, 1999) estimate that the total costs of violence in Latin America sum up to 14.2% of the region's GDP. This

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<sup>2</sup> The Miller, Cohen, and Rossman (1993) estimates are available for murder, rape, robbery and assault only. The costs of additional preventive measures taken by victims, lifestyle changes associated with the marginal crime or legal costs are not estimated. Therefore the results may understate the true costs of crime in 1993.

<sup>3</sup> The confidence intervals for the Cohen, Miller and Wiersema (1996) estimate that the total costs of crime are between \$175 billion- \$27 trillion.

estimation includes the costs of lives lost to homicide, medical care for victims, public and private security measures, justice procedures, and the decrease in investment and production due to violence. According to this study, in 1996 the cost of crime in Mexico reached 12.3% of its GDP.<sup>4</sup> It should be mentioned that the value of property taken in case of theft (which is in fact a transfer of property from one individual to another and not a social cost) is taken into account in this estimation. The Mexican Health Foundation (1998) estimated that in 1995 the costs of violence in Mexico City alone attained 42.4% of the city's GDP. Again, 10% of these costs are due to property transfers during theft, but nevertheless, the percentage is certainly impressive.<sup>5</sup>

However, both LG (1999) and FUNSALUD (1998) calculate the cost attributable to the loss of lives due to homicide assuming that all victims earned the average wage of the population as a whole. Their results can then only be accurate if we assume that the income distribution is the same for victims as it is for the general population. In other words, if victims have a lower or higher income distribution than that of the general population, attributing the average wage to any lost life might introduce an upward or downward bias in their calculations. The same applies for the age and sex distributions. In studies regarding the costs of crime in the United States this type of bias is not uncommon. For example, the costs estimated by CMW (1996) most probably suffer from a major upward bias due to the use of average incomes. This problem is especially serious in countries like Mexico, where homicide victims tend to be poor young males (FUNSALUD and World Bank, 1999). Moreover, LG (1999) and FUNSALUD (1998) do not take into account that the lost lives of individuals in terms of productivity would have changed over the life course. We address both of these issues in this study.

### 3. Methodology

To estimate the social cost of crime is not an easy task for one requires not only very detailed information about monetary losses at the individual level of victims, but also information about the emotional costs experienced. In this study we attempt to measure a part

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<sup>4</sup> This estimate includes the cost associated with lost health, lost lives, material losses, productivity, and investment losses, losses on labor and consumption and property transfers.

<sup>5</sup> FUNSALUD (1998) include in their estimates all of the LG (1999) costs in addition to public expenditures on national security and justice

of social costs of crime in two ways. The first one relates to costs of crimes calculated using aggregate data, more specifically, homicide rates. The second one refers to costs of crime born by individuals as they report. This information is available in victimization surveys, and can be used to have closer order of magnitudes of the costs of crime. In addition, this information is well suited to provide insights into how these costs are distributed across socio-economic status. Following we describe each method along with the data employed.

### 3.1. *Aggregate Data*

We use official databases on homicides of the National Institute of Statistics (INEGI, 1997). These data include information about each reported death in the whole country in addition to providing some socio-economic and demographic characteristics of the deceased. The advantage of homicide rates on any other crime variable is that homicides have a great propensity to be reported, not likewise other types of crime. Most homicides are reported and recorded by the police, the forensic service and the general prosecutors' office. Unfortunately, in the case other crimes, such as robbery or even sexual assault (Frenk, 1997), the report rate generally underestimates the real crime rate.

We will follow a simple economic approach in assessing the value of the life lost, acknowledging that the measure we obtain is a lower bound of the real social costs of crime to society, which would include, not only a crude estimation of labor productivity lost, but also emotional and psychological burdens, a value for human capital losses, and values of decreases in productivity, among the most important. We use information on homicide rates and impute a value of labor productivity lost of each individual deceased. For this purpose we use three different approaches:

#### 3.1.1. Number of Years Lost

We calculate the number of years lost per individual by subtracting age from the number of years of life expectancy and attribute to them the last annual salary earned by an individual. To obtain the cost of crime we sum these figures over all individuals.

#### 3.1.2. Measure of Labor Productivity Lost

We calculate the number of years that each individual would have been labor productive had he not died. Assuming that his/her wage

would have remained constant over his life cycle, we then discount to the year of his/ her death the value of the stream of wages he would have earned until he reached 65 (retirement age). For the discount factors we assume three different rates: 5%, 7% and 10%.

### 3.1.3. Measure of Labor Productivity Lost, Adjusted for Changes in Wage Profiles

We calculate the number of years that each individual would have been labor productive had he not died. Assuming that his/her wage would have changed over the life cycle, and using wage profiles by cohorts of individuals we discount to the year of his/her death the value of the stream of wages he would have earned until he reached 65. To calculate the wage profiles we take into consideration age, education, gender, sector of residence and occupation. For the discount factors we assume three different rates: 5%, 7% and 10%.

### 3.2. *Individual Data*

The costs that emerge from crime and violence are more than just those that can be attributable to the loss of lives. Unfortunately, as was mentioned before, there are no reliable official data bases on types of crimes other than homicides. However, there is a victimization survey for Mexico City that collects information about different types of crimes suffered by individuals and out of pocket expenditures related with crime prevention and crime consequences. The advantage of using this survey instead of official data on crime is that we avoid the problem that arises from under-reporting. In this paper, we analyze the distribution of the costs of crime borne by the victims of crime by per capita expenditure quintile in Mexico City. Per capita expenditure quintiles were constructed using the information on monthly family expenditure provided by the victims in the survey and dividing it by the number of household members in the victim's household (also provided by the survey).

We divided costs into monetary and non-monetary costs. Monetary costs include: 1) direct costs, which comprise the cost of medical care when needed, the cost of the legal procedures that took place while reporting or following the report of the crime, the cost of different safety measures that individuals purchased after being victims of crime, and 2) indirect costs, which consist of the cost of the days lost



to seeking medical care and/or to bad health after being a victim as well as the cost of the days spent in legal procedures.

All direct costs were directly reported by the victims as out of pocket expenses, except for the cost of medical care for those victims who sought care at public health care institutions,<sup>6</sup> in which case the cost of care is estimated using official average costs of different health care interventions provided by a representative public hospital in Mexico City. Indirect costs were calculated by multiplying the number of days lost to seeking medical care or recovering their health and those spent in legal procedures (all reported by the victims) by the daily per capita expenditure of the victims (also reported by the victims). It should be noted that this calculation only provides a lower bound of the real costs for two main reasons. First, due to the absence of income information in the survey, we do not attribute lost income but lost expenditure to the days that were lost, and expenditure is usually lower than income. Second, we are not including the costs of physical or emotional pain and/or stress in this calculation.

Non-monetary costs include the cost of fear (measured through the willingness to pay of individuals not to feel fear after being victims of crime), the opportunity costs of not increasing public safety measures (estimated through the willingness to pay of victims to increase public safety measures) and the willingness to pay to recover the life style they had before the crime. The latter measures in an indirect way the cost of behavioral changes of the victims, such as avoiding leaving home at night, stop working late hours, avoid wearing jewelry, avoid taking public transportation and the like.

It is important to note that all our calculations refer to the costs borne by the victims of crime, given that all information regarding costs was not collected for non-victims in this survey. For this reason, our final estimates regarding the magnitude of the costs will most likely be downward biased.

#### 4. Data

To estimate the social costs of crime at the aggregate level, we use official data bases on homicides for 1997 of the National Institute of Statistics (INEGI, 1997), and on labor income from the Income-Expenditure Surveys also collected by INEGI.

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<sup>6</sup> In Mexico public health care is provided by the Mexican Ministry of Health at no cost for the patients

The data on homicides contains information about the gender of the deceased individuals, educational attainment, sector of residence (county), occupation, and age. The total number of observations is 13,287.

In addition, we use information from the third quarter of the *Encuesta Nacional de Ingreso-Gasto de los Hogares*, ENIGH, a consumer expenditure survey collected from August to November 1996 by the INEGI.<sup>7</sup> The sample size is 12,815 households and is nationally representative when properly weighted with the inflation factors. This survey has information on personal characteristics of the household members,<sup>8</sup> total household and individual labor and non-labor income, household monetary expenditures (commodities that were actually purchased), household non-monetary expenditures (commodities received or paid as in-kind, gifts and auto-consumption), and dwelling characteristics.

We make use of the Income-Expenditure Surveys to calculate mean wages of cohorts of people defined by age, education, gender, sector of residence and occupational categories and cross them with the homicides' data. Given that our main interest is to estimate labor wage profiles, only the information regarding individual labor income was used. The data provided by ENIGH correspond to the wages received in the six months prior to the collection of the survey.

To estimate the social costs of crime at the individual level we use a victimization survey, carried out by the World Bank and FUNSALUD in 1999 (WBF). This survey is representative of the victims of crime in Mexico City and is particularly interesting and well suited for the study of social costs of crime in that it contains a wealth of information that range from monetary costs born by victims as well as questions related to emotional impacts posed in a willingness to pay approach. In addition, it contains some demographic and socio-economic characteristics of victims, which can be used to assess how crime is distributed across selected groups of individuals. Unfortunately, as was stated before, the survey collects information only on monthly family expenditure but not family income. Therefore, all distributions of costs calculated in this study are related to the family expenditure level.

For the collection of the WBF a representative sample of 2,605

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<sup>7</sup> For comparability reasons, exclusively the data pertaining to the third quarter of each year is used in this study.

<sup>8</sup> For each member, age, education, sex, relation to the head and labor force participation information are included.

households was randomly selected.<sup>9</sup> In each household the first person who answered the door was asked whether he or she had been a victim of any type of crime in the past six months. When the answer was positive the person was interviewed. In total, 993 individuals were found to have been victims of a crime in the six months prior to the interview, while the rest (1,612 individuals) had not been victims of any type of crime. Therefore, the complete survey was answered by all 993 victims. Basic socioeconomic indicators were only registered for 598 non-victims.<sup>10</sup> The survey provides no information about the remaining 1,014 non-victims. In this study we only take into account the information related to the victims, and therefore we work with a sub-sample of 993 individuals. Table 1 shows several interesting frequencies regarding the victims of crime.

**Table 1**  
*Frequencies Regarding the Victims of Crime*

<i>All victims (n = 993)</i>	<i>Percentage</i>
<i>Gender</i>	
Male	56
Female	44
<i>Number of household members victimized in past 6 months*</i>	
1 (respondent only)	78
2 (including respondent)	15
3 (including respondent)	4
whole family	3
<i>Number of crimes suffered in past 6 months (by respondent)</i>	
1	86
2	11
3+	3

<sup>9</sup> For detailed information about sampling and survey methodology, please refer to: FUNSALUD and World Bank, 1999.

<sup>10</sup> The only information collected regarding these non-victims was their county of residence, the number of household members in their household, the monthly family income and their perception of crime in the county. No information was collected at the individual level.

**Table 1**  
(continued)

<i>All victims (n = 993)</i>	<i>Percentage</i>
<i>Type of crime**</i>	
Larceny theft	62
Robbery	32
Physical aggression	5
Sexual assault/kidnapping	1
<i>Age</i>	
Under 20	13
20 - 30	32
31 - 40	31
41 - 50	14
51 - 60	5
61 +	5
<i>Place of crime</i>	
Victim's neighborhood	43
Street	26
Public transportation	23
Work place/ school	3
Bars/nightclubs	3
Banks	2
<i>No. of household members who contribute to family expenditure</i>	
1	49
2	30
3+	21

\*The survey collected information only about the respondent, but did not collect information about the crimes suffered by members of the respondent's household who had also been victimized.

\*\*The survey includes five possible categories of crime: larceny theft (defined as theft without violence), robbery (defined as violent theft), physical aggression (without theft), sexual assault and kidnapping. Percentages refer to the last type of crime suffered by the respondent.

Regarding the socioeconomic characteristics of the interviewed, the average family monthly expenditure was \$2,404 pesos (approximately USD\$ 240) and the median was \$3,302 pesos (approximately USD\$330). The average number of household members in each household was 5.

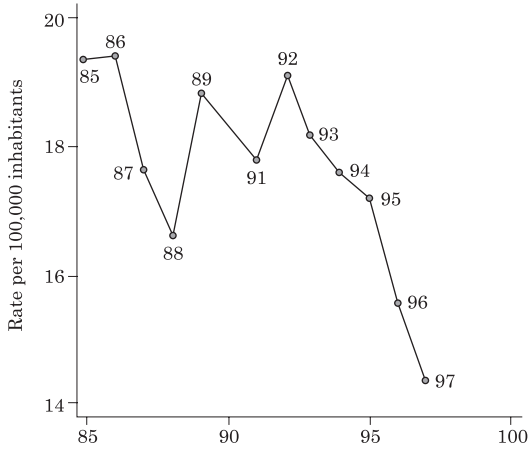
## 5. Costs of Crime

### 5.1. *The Level of Homicide Rates Across Mexican States*

As can be seen from figure 1, the homicide rate at the national level has decreased over the last decade. These changes have not been equally distributed across states, and the distribution has changed somewhat over time, with a relative increase in the homicide incidence in Mexico City and states in the North West of Mexico. According to Messmacher (2000) there is some absolute convergence during the period 1979-1997 in homicide rates across states, which has taken place by a reduction of homicide rates in high homicide states and an increase in homicides in low homicide states. Table 2 reports descriptive statistics of the homicide data by quintiles of labor income in 1997. It is interesting to note that it is the lowest quintiles that exhibit a higher proportion of deceased women relative to the rest. This suggests that poor women are relatively more vulnerable. Another interesting fact is that younger individuals are killed in lower quintiles as opposed to older in upper ones.

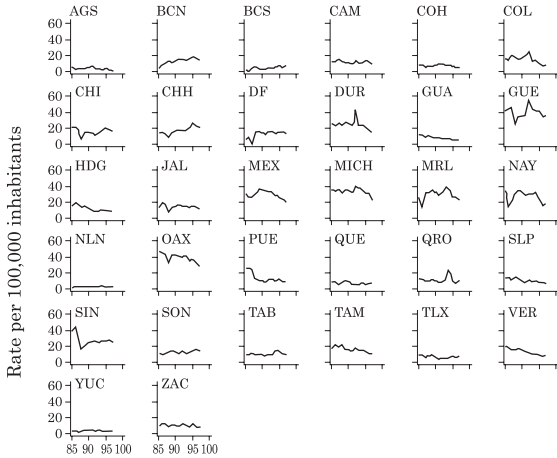
Table 3 presents the results for the estimated costs of homicides under the three different alternatives. Column 1 refers to the estimated costs taking into consideration differences in wage profiles for three different assumptions with respect to the discount factor ( $r=0.05$ ,  $r=0.07$  and  $r=0.10$ ). Column 2 refers to the costs assuming a constant wage over the life cycle, while the last column presents the results relating a number of years lost due to the homicide. It can be noted that the highest costs are obtained when taking into consideration that wages of the deceased individuals would have grown over time for young people and decreased for older ones. These costs are of serious magnitude. To make a sizable comparison, table 4 includes the costs as a proportion of GDP. It should be emphasized that methodologies that only include the number of years lost severely underestimate the costs of homicides.

**Figure 1**  
*National Rate of Homicides*



Source: INEGI.

**Figure 2**  
*Rate of Homicides by State*



Source: INEGI.

**Table 2**  
*Homicides in Mexico: 1997 by Quintiles of Labor Income*

	<i>Quintiles</i>				
	1	2	3	4	5
	<i>Gender</i>				
Man (%)	69.40	90.67	96.05	99.55	94.36
Woman (%)	30.60	9.33	3.95	0.45	5.64
	<i>Age</i>				
Mean	26.97	27.24	31.32	48.66	33.92
Std. Dev.	(22.71)	(11.24)	(10.98)	(10.67)	(10.57)

Source: Own estimation using INEGI 1997

**Table 3**  
*Costs of Homicides under Different Alternatives*  
*(1997 dollars)*

	<i>Wage Profiles</i>	<i>Constant Wages</i>	<i>Years Lost</i>
	<i>A. National</i>		
r = .05	2,240,506,330	436,708,861	1,265,882,785
% GDP	0.61		
r = .07	1,670,886,076	353,164,557	

**Table 3**  
(continued)

	<i>Wage Profiles</i>	<i>Constant Wages</i>	<i>Years Lost</i>
% GDP	0.046		
r = .10	1,249,367,090	272,151,899	
% GDP	0.0003		
<i>B. Mexico City</i>			
r = .05	212,658,228	65,569,621	186,075,949
% GDP	0.25		
r = .07	159,493,671	33,195,877	
% GDP	0.19		
r = .10	119,493,671	5,291,139	
% GDP	0.14		

Source: Own calculations using official and ENIGH homicides rates.



**Table 4**  
*Total Costs of Crime in the Metropolitan Area of Mexico City, 1999*

<i>Cost Category</i>	<i>Sum WBF survey (pesos)</i>	<i>Total estimate for Mexico City (thousand pesos)</i>	<i>% GDP (1998)</i>
Medical expenses (paid by victims)	25,000	174,138	0.02
Cost of public medical care for victims <sup>1</sup>	1,861,918	12,969,225	1.56
Cost of days lost to medical expenditure/bad health	30,264	210,805	0.03
Expenditure on safety measures	35,300	245,883	0.03
Cost of legal procedures	32,230	224,499	0.03
Cost of days lost to legal procedures	37,597	261,883	0.03
Cost of fear	78,308	545,456	0.07
WTP to increase public safety	49,855	347,266	0.04
WTP to recover previous way of life	34,435	239,858	0.03
Cost of homicides <sup>2</sup>		2,126,582	0.25
<i>Governmental Expenditure<sup>3</sup></i>			
Justice System		3,366,708.9	0.42
Public Security Measures		8,345,336.3	1.04
Police Training		99,865.4	0.01

**Table 4**  
(continued)

<i>Cost Category</i>	<i>Sum WBF survey (pesos)</i>	<i>Total estimate for Mexico City (thousand pesos)</i>	<i>% GDP (1998)</i>
Crime Prevention Programs in Special Areas		9,802.4	0.001
Costs of Incarceration		783,931.0	0.10
<b>Total Social Costs</b>	<b>2,184,906</b>	<b>29,951,236.7</b>	<b>3.61</b>
Value of transfers (property taken)	5,344,550	37,227,562.6	4.48
<b>Total Costs (including costs of transfers)</b>	<b>N = 993</b>	<b>67,178,799.3</b>	<b>8.1</b>
		N = 6,916,760	

1/ Calculated by multiplying average cost of injury by type, in public hospitals in Mexico City.

2/ Calculated using a wage profiles methodology and a 5

3/ Source: *Cuenta Pública del Gobierno del Distrito Federal, 1999, GDF.*

5.2. *The Costs of Crime in Mexico City*

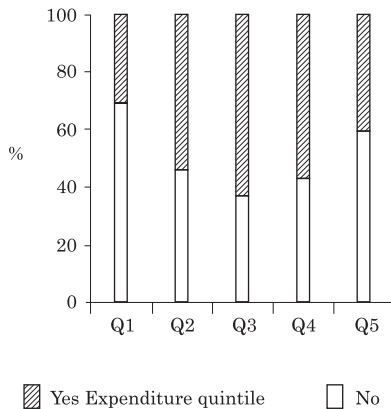
To assess how crime is distributed across socio-economic groups, we use the WBF survey to construct five per capita expenditure groups based on the monthly expenditure reported by the victims. Hereafter we will refer to these expenditure groups as quintiles, being the first quintile (quintile 1) the one that assembles those individuals that fall into the first 20% of the per capita expenditure distribution and the last quintile (quintile 5) the one where individuals with a monthly per capita expenditure above the 80% of the distribution are grouped.

5.2.1. Monetary Costs of Crime by Expenditure Quintile

5.2.1.1. Costs of Medical Care

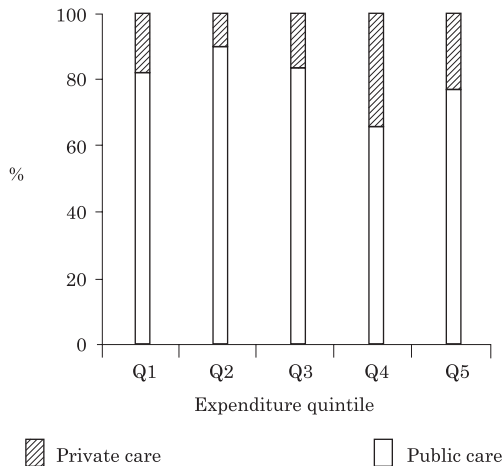
According to the WBF survey, 23% of the victims suffered injuries as a consequence to robbery or physical aggression, most of which were produced by blows with hands or feet (63%), 18% by knives, 14% by firearms and 9% by some other type of object (chains, tools, etc.). Slightly more than half (51.6%) of the injured victims received medical care. However, this percentage varies across quintiles (see figure 3), for most of the medical care is sought by individuals in medium quintiles.

**Figure 3**  
*Percentage of injured victims who sought medical care by quintile*



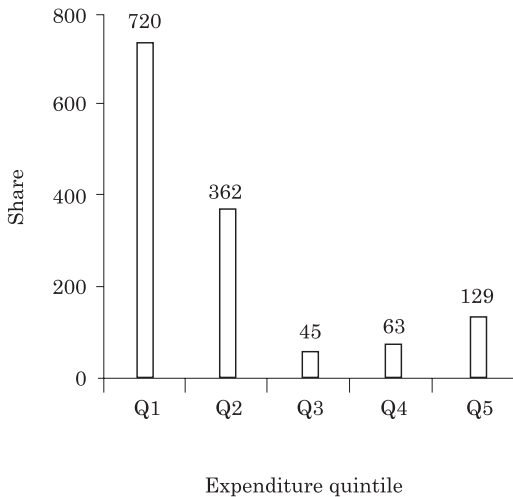
Of all injured victims who sought medical care, 21% received it in private health care institutions, 47% received it in Social Security Institutions, 3.4% in the Ministry of Health, 11% in the City's public hospitals and 11% in the Red Cross. The rest received care in an ambulance or at their or their neighbors' home. Of the individuals who sought for medical care 25% paid for their treatment, and spent on average \$1,136 pesos (approximately US\$110). The percentages slightly vary across quintiles. Figure 4 shows the percentage of individuals within quintiles that sought for care in public/social security institutions and in private ones. We note that the vast majority of individuals across quintiles tend to seek public health care after being victims of crime. Private health care is mostly used by individuals in quintile 4. In Mexico, health care of any type is free of charge in public institutions. In social security institutions care is free of charge for individuals entitled to social security but emergency care is free of charge for any individual. We would therefore expect individuals that sought private health care to bear most of the cost of the service; however this is not the case.

**Figure 4**  
*Percentage of users of public and private health care by quintile*



We calculated the share of the monthly per capita expenditure that the medical expenses represented for each quintile. The results are astonishing in terms of the inequality in the distribution of the shares. The medical costs for individuals in quintile 1 reach, on average, 720% of their monthly per capita expenditure. The average share decreases as expenditure level increases. However, it is those individuals in quintile 3 who paid the smallest proportion (45%) of their monthly expenditure in medical expenditures. Therefore, even if individuals from low quintiles seek less medical care, the monetary amount paid for private care (or social security in case of not being entitled to it or not being considered an emergency) by these individuals is much higher in relative terms than that paid by individuals in other quintiles. In total, medical expenditures reached 25,000 pesos (US\$2,660). Figure 5 depicts the average cost of medical care by expenditure quintile.

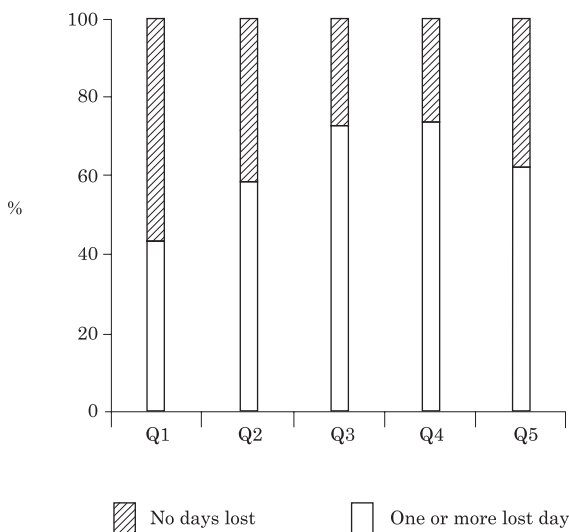
**Figure 5**  
*Average cost of medical care by quintile,  
in terms of monthly expenditure shares*



Injured individuals lost, on average, 6.9 work or school days after the crime. In total, 756 productive days were lost. The percentage of individuals who lost one or more days because of medical care and/or

bad health increases from quintile 1 to quintile 4 and decreases again for individuals in quintile 5 (see figure 6). The total cost of the days lost to medical care and/or bad health after the crime amounts 30,264 pesos (US\$ 3,220) for the victims of this survey. As for the shares of the cost of the days (relative to expenditures) that were lost to medical care and/or bad health, we note that individuals in quintile 4 bear the highest share (see figure 7).

**Figure 6**  
*Percentage of victims who lost/did not lose work or school days to medical care or bad health*



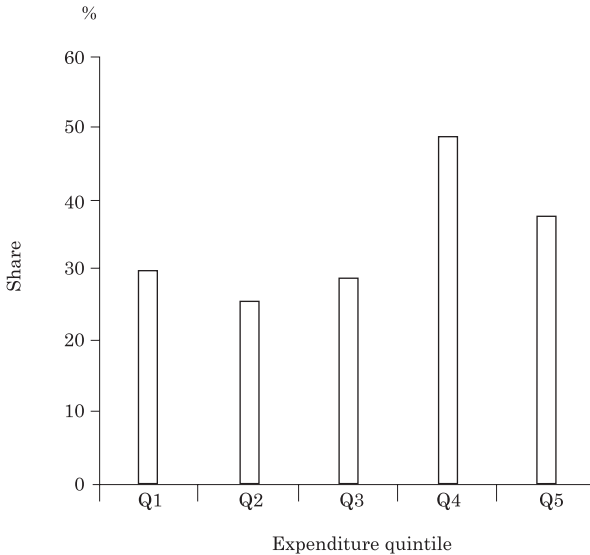
The most frequent injuries that the victims suffered were contusions or physical traumas (84%) and superficial wounds (14%). The rest suffered from deep wounds or cranial contusions. We estimated the social cost of the medical care of those victims who did receive care but did not pay for it by multiplying the number of injuries (by type) by the average cost of medical care by type of injury in public hospitals in Mexico City.<sup>11</sup> The total cost for treatment of the in-

<sup>11</sup> The costs were provided by *Hospital Balbuena*, a public hospital in Mexico City. Unfortunately, it is the only hospital for which average costs of interventions were available for every type of injury that was reported by the victims of

juries that were taken care of by public or social security institutions was 1,861,918 pesos (US\$198,076).

**Figure 7**

*Average cost of days lost to medical care and/or bad health by quintile, in terms of monthly expenditure shares*



#### 5.2.1.2. Cost of Legal Procedures

In the survey, victims were asked if they had to undergo any type of legal procedure related to the crime. Legal procedures embrace all legal actions that were taken after the crime, from reporting it to the police to hiring a lawyer. Even the costs of some illegal actions, such as bribing the legal system workers in order to facilitate the investigation or to have their case followed up are taken into account. In Mexico, the legal process to report any type of crime is free of charge to the public. However, the cases in which the victims had to bribe the police or to hire a private lawyer obviously represented an out of pocket expenditure for the victims. It should be noted that in

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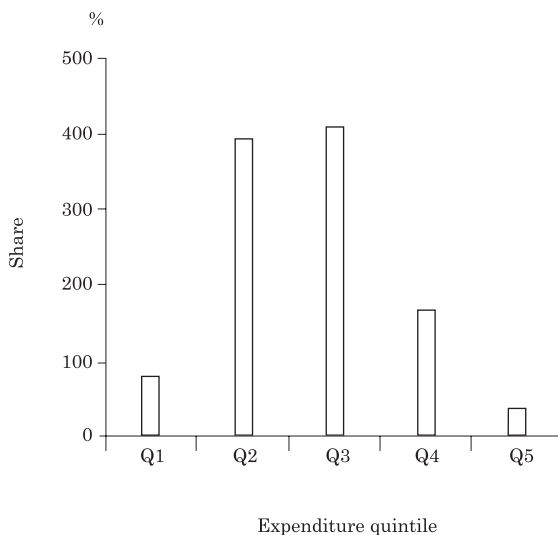
the survey. The costs of care are usually homogeneous across public hospitals, however, they may vary in social security and Red Cross hospitals, and therefore our estimate should be interpreted with care.

the following calculations we do not include the costs that the legal procedures represent to the public legal system of the city. We only take into account the out of pocket expenditures that were borne by the victims.

The crime-reporting rate was 17%. The reporting rate varied according to the type of crime. Only 15% of the victims of larceny reported the crime, whereas 21% of the victims of robbery reported it. The reporting rate also depended on the age of the victim. Indeed, the rate increases with age: 18% of the victims between 15 and 24 years reported the crime, while 22% of victims over 60 reported it. Across quintiles, only 12.5% of victims who belong to quintile 1 reported the crime, while 20.7% of those victims in the highest quintile reported it. The percentages for quintiles 2, 3 and 4 are 18.5%, 14.5% and 19.5% respectively.

Only 16% of the victims who reported the crime had to pay for the legal process. By quintiles, this percentage varies. In quintile 1 only 9% of the victims paid for the process. Quintile 2 has the highest percentage of victims who paid for the procedure (28%), while quintiles 3, 4 and 5 have 17%, 18% and 23% of individuals, respectively, who paid for the legal procedure.

**Figure 8**  
*Average cost of legal procedure by quintile,  
in terms of monthly expenditure shares*

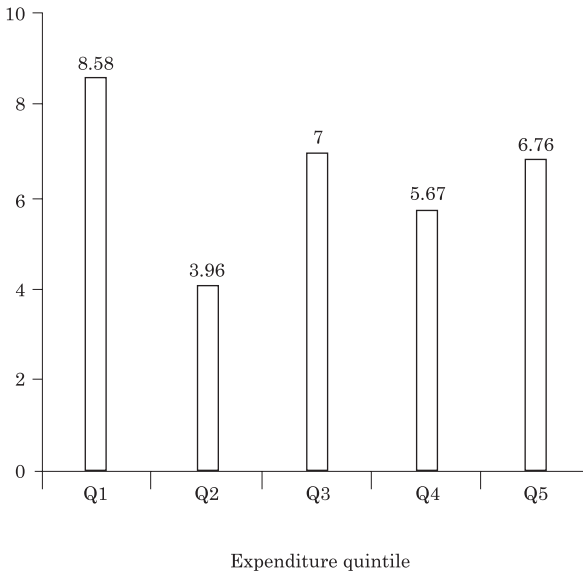




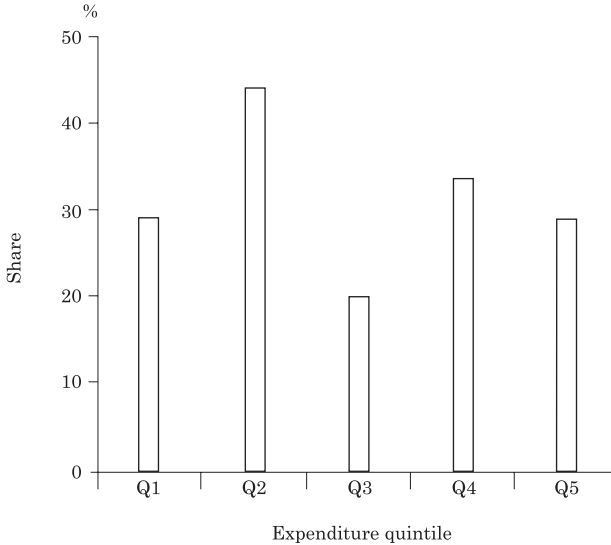
We calculated the share of the monthly per capita expenditure that legal procedure costs represented for individuals in each quintile. Figure 8 shows the distribution of the shares by quintile. Individuals in quintile 1 had to pay the equivalent of 74% of their monthly total outlay in the legal procedures. However it is those individuals in quintiles 2 and 3 who pay the highest proportions: 390% and 394% of their monthly expenditures respectively. The proportion decreases again for individuals in quintiles 4 and 5.

The legal process is time consuming. On average, each person who reported a crime invested 6.35 days in the legal process. By quintile, individuals in quintile 1 invested more than 8 days on average on legal procedures. The average number of days lost to legal procedures by quintile is shown in figure 9. The cost of these lost productive days relative to monthly expenditure by quintile is shown in figure 10. As we can see, even if individuals in quintile 2 spent the lowest number of days, on average, in legal procedures, they bear the highest share relative to their income.

**Figure 9**  
*Average number of days lost to legal process*



**Figure 10**  
*Average cost of days lost to legal procedure  
 by quintile, in terms of monthly expenditure shares*



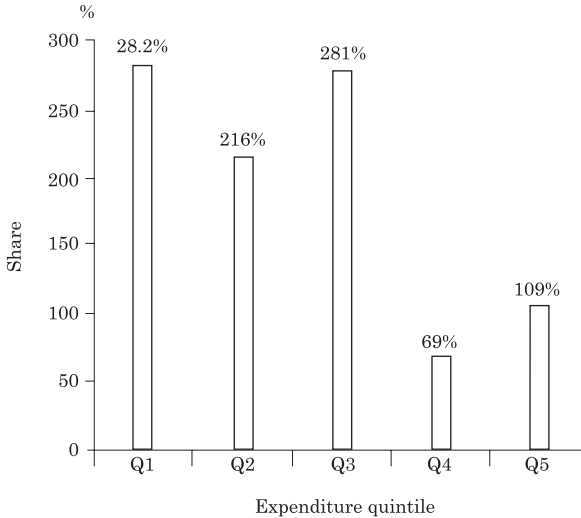
### 5.2.1.3. Cost of Safety Measures

Individuals were asked about their expenses on different personal safety measures that might have been purchased after the crime. Safety measures included firearms, knives, mace or pepper spray, alarms or security locks for their houses, life insurance, personal asset insurance, installing some private security system in their neighborhood, renting a parking lot for their cars and hiring personal security.

Only 8.9% of the victims spent on some of the above safety measures. Of those victims who paid for security measures, 46% bought alarms or safety locks for their homes, 22% bought a firearm, 18% rented a parking lot for their car, 4% bought pepper spray 2.8% bought knives, 2.7% bought personal asset insurance, 2.7% installed a private security system in their neighborhood and 1.3% hired personal security. The individual costs of these measures vary between 60 and 5,000 pesos (US\$6.4 to US\$532), with a mean of 1,038 pesos (US\$110). The total cost amounted 35,300 pesos (US\$3,755). By expenditure quintile, we find that for individuals in quintiles 1, 2 and 3 the costs of safety measures more than doubled their monthly per

capita expenditure, while individuals in quintiles 4 and 5 paid the equivalent to 69% and 109% of their monthly per capita expenditure respectively (see figure 11).

**Figure 11**  
*Average cost of safety measures by quintile,  
in terms of monthly expenditure shares*



As was mentioned in sections 3 and 4, the survey does not provide information on any type of cost borne by non-victims, and expenses on safety measures are not the exception. Therefore, the resulting costs of safety measures most probably underestimate the real costs, for non-victims probably also spend on safety measures.

### 5.2.2. Non-Monetary Costs of Crime by Expenditure Quintiles

Given that neither crime nor crime reduction are sold in a competitive market, the best way -in accordance with the economic theory- for economists to measure the costs that arise from crime is through estimating the willingness to pay (WTP) for a reduction in the rate of crime. One method that is commonly used to elicit measures of WTP is called contingent valuation (CV). In this approach, the answer

to a valuation question is contingent upon a particular hypothetical market described to the respondents. Thus, the CV method collects information on individuals' preferences by asking them how much money they would be willing to pay for some change in the provision of a commodity. In other words, people are asked about their hypothetical willingness to make a trade off between money and a change in a certain risk in question. In the case of crime, we are interested in the maximum amount of money that individuals would be willing to pay in order not to be exposed to violence or crime.

As has been recognized, the main advantage of this method is that it is relatively simple and straightforward in practice. It is also a very dependable method when the proper guidelines are followed in the conduction of the study (Portney, 1994).<sup>12</sup> However, CV studies generally suffer from several important problems. The most common one is to make the scenario sufficiently comprehensible, plausible and meaningful to respondents. Moreover, there are a number of sources of potential biases that might lead to a possible under or over estimation of the true WTP, such as the incentives that individuals have to misrepresent responses and the inference biases.<sup>13</sup> Such biases are generally difficult to control for. It has become standard practice in the CV literature to eliminate some responses as being unreasonable (for example, more than 5 percent of income for an environmental public good that contains only nonuse value). Similarly, it is standard practice to eliminate some responses of zero on the basis that they are "protest zeros" against the investigation or because individuals think it is not their responsibility to pay for something that is someone else's responsibility (Diamond and Hausman, 1994), like crime reduction, for example. Likewise, individuals may receive a "warm glow" from expressing support for good causes, or they may be describing what they think is good for the country in a casual way. Similarly, low-income people might suspect that they might be harmed if they report a low WTP. This is why it has been claimed that in CV studies it is better to ask people what percentage of their income they are willing to pay rather than to ask them for an absolute amount of money, or, as an alternative, what the government should

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<sup>12</sup> The guidelines suggested by Portney are: use personal interviews (as opposed to mail interviews), ask WTP for future outcomes and not for counterfactual past outcomes, use close-ended questions, accurately describe the scenario, mention a budget constraint, mention all substitutes for the commodity and include a de-briefing at the end of the interview.

<sup>13</sup> For an analysis of all sources of potential biases in CV studies see Johannesson and Jonsson (1990).

be willing to pay (Pauly, 1995). In summary, the misrepresentation of responses bias implies that responses are not an attempt by an individual to evaluate his own preference for a commodity. The only way of minimizing these kinds of biases is to have a sample large enough to make the survey as a whole useful for policy purposes.

In the WBF survey, three CV questions were included. The survey asked the victims their maximum WTP not to feel fear, their maximum WTP for an increase in public safety measures and their maximum WTP for recovering the lifestyle and behavior they had before the crime. The question is: are these three measures of WTP really measuring different types of costs or are they measuring the WTP for reducing crime and violence in three different ways? The answer is not straightforward. The question is important if one wants to avoid a double counting problem. In what follows we will treat each CV question separately. However, the reader should be aware of the fact that all three WTP measurements could in fact be reflecting the same type of cost. Note again that non-victims were not asked any cost-related question in the survey, and therefore, our results very likely underestimate the total value of non-monetary costs caused by crime in the city.

#### 5.2.2.1. Cost of Fear

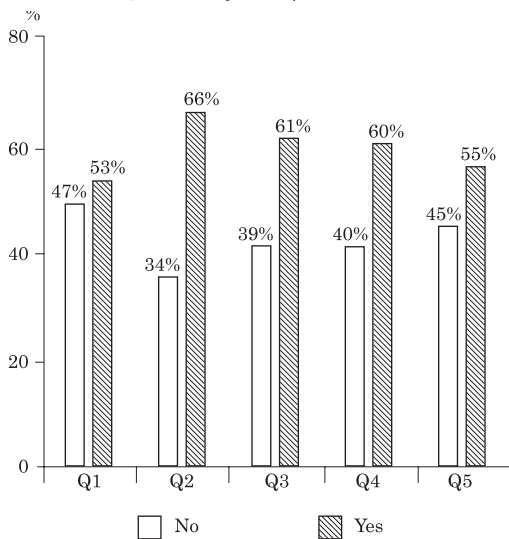
We approximate the cost of fear by using the amount of money that the victims would be willing to pay to avoid feeling fear. Besides their willingness to pay to avoid feeling fear, victims were asked whether they had suffered any psychological damage during or after the crime. 59% of the victims answered yes to this question. As can be seen in figure 12, across quintiles the percentage of individuals who suffered psychological damage is higher than that of those who did not.

Surprisingly, in the aggregate only 45% of the victims stated that they would be willing to pay something not to feel fear. The proportion of individuals unwilling to pay is higher than that of those willing to pay across all expenditure quintiles, as can be seen in figure 13. We calculated the willingness to pay in terms of shares of the monthly expenditure by quintile. The results are depicted in figure 14.

The individuals in quintile 1 were willing to pay more than 50% of their monthly expenditure. Individuals in quintile 2 were willing to pay over 60% of their monthly expenditure. From quintile 3 to quintile 5 the share decreases as the monthly expenditure increases.

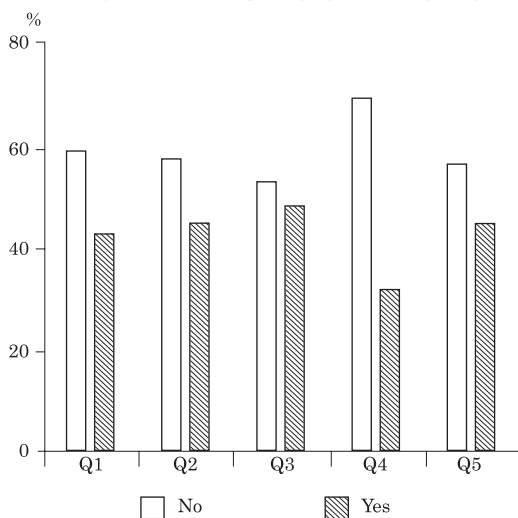
**Figure 12**

*Did you suffer from phychological damage during or after the crime?*

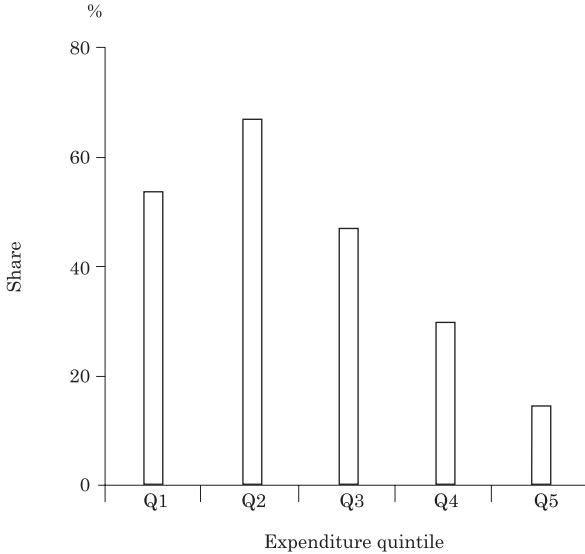


**Figure 13**

*Would you be willing to pay not to feel fear?*



**Figure 14**  
*Cost of fear by quintile, in terms  
of monthly expenditure shares*



#### 5.2.2.2. Opportunity Costs of Not Increasing Public Safety Measures

Individuals were asked about their willingness to pay to increase public safety measures. We interpret the willingness to pay for such measures as the opportunity cost of not providing an efficient level of public safety measures.

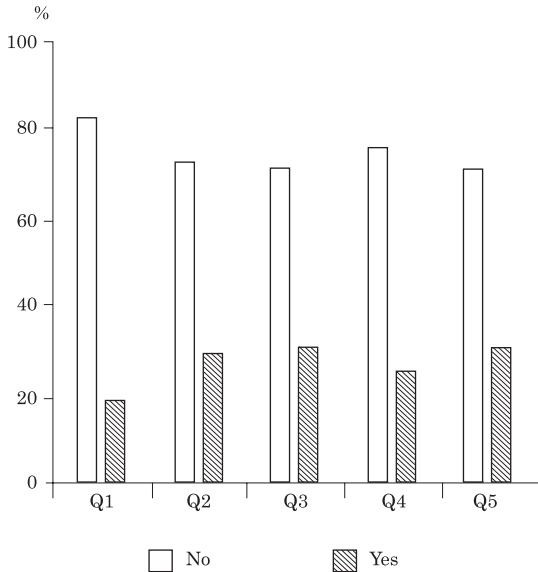
Only 28% of the victims were willing to pay for such measures. The percentage of victims not willing to pay is above 65% for all quintiles. This could be due to “protest zero” type answers,<sup>14</sup> given that public safety measures are paid by the general public through taxes and the possibility of paying even more for this matter can be considered unfair by the interviewed. This opposition to paying more than they are already paying can be expressed through answering that they are not willing to pay anything, thus biasing downwards their

<sup>14</sup> “Protest zero” type answers to willingness to pay questions happen when individuals are against paying for something that they consider to be other’s (such as the government’s) obligation. They are a form of strategic bias of the true willingness to pay for the good or service.

true valuation of an increase in public safety measures. Therefore, the results might underestimate the true willingness to pay for an increase in public safety measures. Figure 15 shows the percentage of persons who are and are not willing to pay for an increase in public safety measures by quintile.

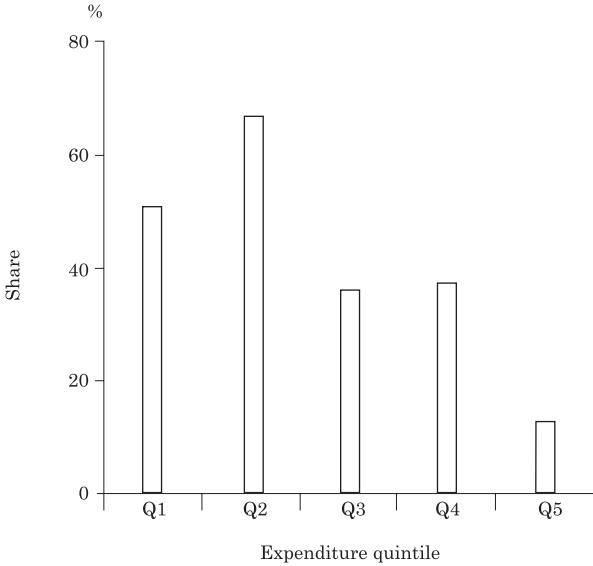
We calculated the shares of the willingness to pay for public security measures in terms of expenditure for each quintile. Figure 16 above shows the distribution of these shares across quintiles. The shape of the average shares across quintiles has an inverted U-shape. Even if the percentage of individuals who are willing to pay is low for all quintiles, for quintiles 1 and 2 the opportunity cost of not increasing public safety measures represents 50% and 63%, respectively, of their monthly expenditure. For individuals in quintiles 3 and 4 it represents almost 40% of their monthly outlay, and for those individuals in quintile 5 the opportunity cost is equivalent to 12% of their monthly expenditure.

**Figure 15**  
*Would you be willing to pay to  
increase public safety measures?*





**Figure 16**  
*Average WTP to increase public safety by quintile,  
 in terms of monthly expenditure shares*



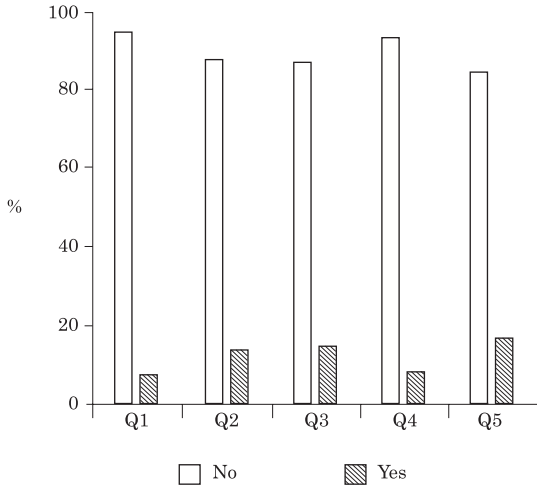
### 5.2.2.3. Cost of Behavioral Changes After the Crime

Individuals were asked if they had changed their lifestyle or behavior after the crime. In general, 40% of the victims changed their lifestyle after being victimized. Most of them (21%) began to avoid going out at night, 19% decided to carry less money with them, 14% stopped wearing jewelry, 10% began leaving their houses less frequently, 9% to dress less elegantly, 8% to avoid public transportation, 5% no longer go out for walks, 3% changed their working hours, and 3% decided not to use automatic cash-points machines anymore.

These changes in behavior represent an intangible cost to society. This cost is that of not feeling free to behave as one would in non-violent surroundings. In order to measure the magnitude of such a cost, the survey also asked the individuals about their willingness to pay to recover their previous lifestyle or behavior. Only 11.8% of the victims answered that they would be willing to pay something to recover their previous way of life. For all quintiles the percentage of individuals who are unwilling to pay exceeds 80% (see figure 17).

**Figure 17**

*Would you be willing to pay to recover your previous lifestyle?*



**Figure 18**

*Cost of lifestyle or behavioral changes by quintile, in terms of monthly expenditure shares*

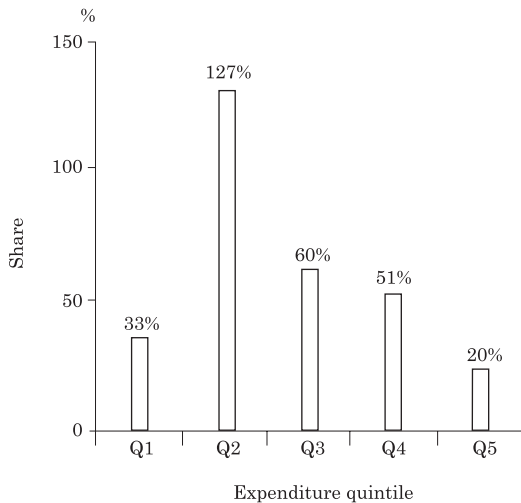


Figure 18 shows the distribution of the costs that changing their lifestyle or behavior represents to victims, in terms of proportions of their monthly expenditure. For individuals in quintile 2 who expressed a willingness to pay, changing their behavior represented a cost that is equivalent to 127% of their monthly expenditure. Individuals in other quintiles have lower shares.

### 5.3. *Value of Property Transfers*

Property transfers refer to the monetary amount of property that was stolen through robbery or larceny. These transfers will not be considered in estimating the social costs of crime, for they do not represent lost property but property transferred from one individual to another, even though the means of the transfer was illegal.

The survey data show that 91% of the victims suffered material losses of an average value of \$7,116 pesos (US\$757). By quintile the percentage of victims who lost property does not vary significantly. The most frequent losses were money (69%), personal possessions (10%), car (8.7%), jewels (6.5%), electric or electronic equipment (4.3%), and food (1.5%).

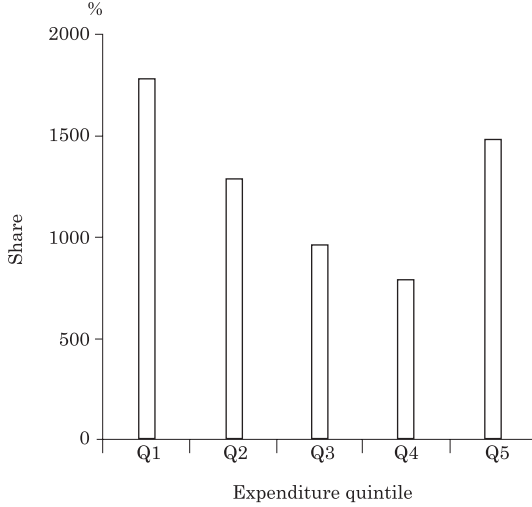
When calculating the share that the value of the transfers represent for each expenditure quintile, we find that individuals in quintile 1 lost over 1500% of their monthly expenditure (see figure 19). The share decreases as expenditure level increases until quintile 4, and then rises again in quintile 5, where the value of these losses represented, on average, 1500% of their monthly expenditure.

### 5.4. *Putting Costs Together*

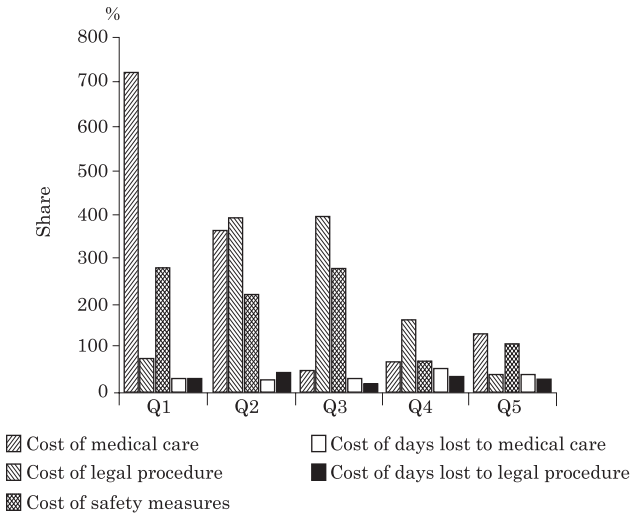
#### 5.4.1. Monetary Costs

Figure 20 depicts the distribution of the shares that the monetary costs of crime represent for individuals in terms of their monthly expenditure. For individuals in quintile 1 the major cost by far is that of the medical expenses, equivalent to more than 7 times their monthly per capita expenditure. Medical expenses also represent a high share for quintile 2 (over 350% of their monthly per capita expenditure) but are slightly surpassed by the costs of legal procedures. The latter represents the highest share for individuals in quintiles 3 and 4. The costs of safety measures are higher for those individuals in quintiles 1, 2 and 3 than for those in quintiles 4 and 5. The costs of the days

**Figure 19**  
*Value of transfers as share of expenditure, by quintile*



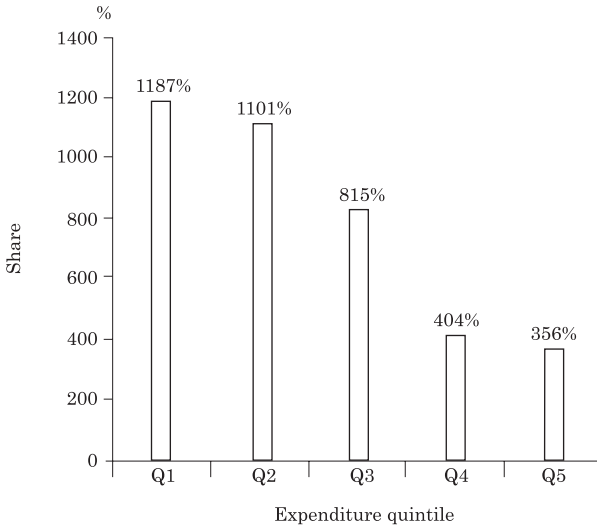
**Figure 20**  
*Monetary costs of crime by quintile, in terms of monthly expenditure shares*



lost either to medical care or to legal procedures represent the lowest shares for all quintiles.

Figure 21 aggregates the shares of all monetary costs by quintile. The result is astonishing in terms of the inequitable distribution of the shares across quintiles. After being victimized individuals in quintile 1 end up paying a sum equivalent to 1187% of their monthly expenditure, while for individuals in quintile 5 this sum represents 356% of their monthly expenditure.

**Figure 21**  
*Total monetary costs of victimization by quintile, in terms of monthly expenditure shares*



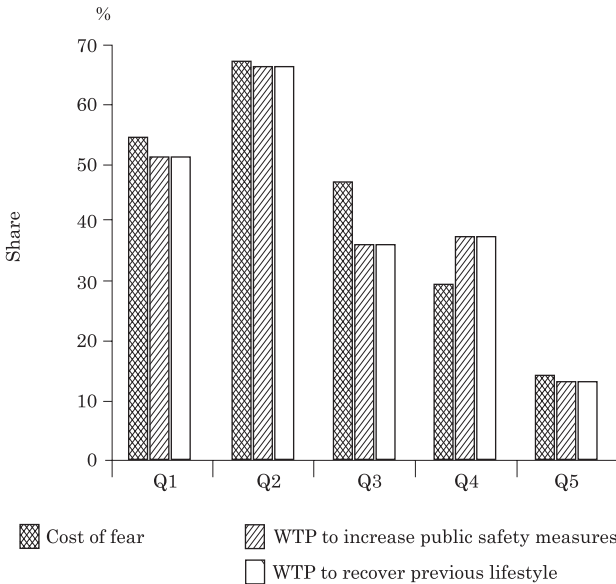
As figure 21 shows, the proportion of monthly expenditure represented by the total costs of crime decreases as expenditure increases. The impact of crime in terms of monetary social costs is therefore much higher for the poor than for the rich in Mexico City, in general terms.

#### 5.4.2. Non-Monetary Costs

Figure 22 shows the distribution of non-monetary costs (those measured through willingness to pay) for individuals in terms of their

monthly expenditure. The proportion of all non-monetary costs with respect to monthly expenditure is much smaller than that of any of the monetary costs, with the exception of the costs of lost days. The cost of fear is higher than other non-monetary costs for individuals in quintiles 1, 2, 3 and 5. The willingness to pay for an increase in public safety measures (or the opportunity cost of not increasing these) is higher for individuals in quintile 2 than for all other individuals and almost equal to the willingness to pay to recover the previous lifestyle in all quintiles.

**Figure 22**  
*Non-monetary costs of victimization by quintile, in terms of expenditure shares*



The distribution of non-monetary costs still favors individuals in quintiles 3, 4 and 5. The highest impact of all non-monetary costs falls on individuals in quintile 2. It should be remembered that these three measures of apparently different non-monetary costs might in fact be measuring the same. If this were the case, figure 22 would allow comparison of the different measurements of the monetary value that society attaches to reductions in crime and violence that can be obtained under three different types of CV questions.

### 5.5. *Social Costs of Victimization: Are They Big?*

If the WBF survey is representative for Mexico City and its suburbs, we can extrapolate the survey's results to the population of the metropolitan area. In 1999 the population of the metropolitan area was 18,202,000 (Mexico City had 8.6 million inhabitants and the suburban areas 9.6 million). If while collecting the survey 993 individuals out of 2,605 answered that they were victims of crime in the past six months, then the victimization rate is 38%. Assuming this estimate is representative of the population in Mexico City and its suburban areas, the number of victims in the metropolitan area reaches 6,916,760. Table 4 shows the total costs of victimization for the 993 victims in the survey, the total costs of victimization in the metropolitan area and the percentage that these costs represent in terms of Mexico City GDP in 1998. The reader should remember that these costs are those borne only by the victims. The highest proportion corresponds to that of the medical care the victims receive: out of pocket expenditure in medical care and the cost of the public care together add up to 1.6% of the City's 1998 GDP.

When the cost of lives lost to homicides and the governmental expenditure on crime prevention, prosecution, and justice are taken into account, the total social costs of crime in the metropolitan area of Mexico City in 1999 amount to 3.61% of the City's 1998 GDP. When property transfers are taken into account, the total cost of crime and violence reaches 8.1% of the City's GDP.

## 6. Conclusions

This paper is a first attempt to measure and compare the costs of homicides under three different alternatives. Two of them -considering only the number of years lost to homicides and assuming a constant wage over the life cycle- have been used in previous studies. Given that both of these methodologies severely underestimate the costs of homicides, we propose a third alternative for measuring costs: taking into consideration differences in wage profiles. The highest costs are obtained under this new approach, that is when taking into consideration that the wages of the deceased individuals would have grown over time for young people and decreased for older ones. Under this approach the social costs of crime attributed to losses of lives due to homicide in 1997 amounts to between .03 and .6 percent of Mexican GDP, depending on the assumptions about the discount factor.

Regarding other types of crime, we found that the social costs of crime and crime prevention in Mexico City in 1999 approximate 3.6 percent of the City's GDP in 1998. It should be noted that in this calculation we did not take into account the expenditure of private firms on private security, other victimization costs, such as family violence, nor the monetary and non-monetary costs borne by non-victims of crime. Therefore, the figure most likely underestimates the true cost of crime and violence, and further data, including the collection of victimization surveys that take into account the costs borne by non-victims, would be most helpful for further research in this field.

It is interesting to note the relatively high weight that medical expenses represent in the total victimization costs. For the poorer individuals out of pocket expenditure in health care is by far the major cost that they have to face, for it is equivalent to more than 7 times their monthly per capita expenditure.

When we aggregate costs for each quintile, we find that the proportion of the monthly expenditure that the total costs of crime represent decreases as monthly expenditure increases. The impact of crime in terms of monetary social costs is therefore much higher for the poor than for the rich in Mexico City.

Regarding non-monetary costs, three measures of willingness to pay were considered. Regardless of which one of the three should be considered as the true measure of the cost of crime and violence, the distribution of the shares that these costs represent in terms of monthly expenditure still favors individuals in quintiles 3, 4 and 5.

In Mexico City, policies aimed at reducing the cost that crime imposes on society should therefore focus on the poor. Moreover, if, as according to the literature, one of the causes of crime is an unequal income distribution, and, as we find out in this paper, crime tends to widen the gap between the poor and the rich, a vicious cycle might be avoided by focusing on the individuals who are the most affected by crime and violence.

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