



Physical therapists strap a gunshot victim to a robot-assisted walking device in Chicago in June 2005.
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The Instrument Matters

ASSESSING THE COSTS OF SMALL ARMS VIOLENCE

INTRODUCTION

My life has not been easy the last few years. I've gone through three robberies and the death of my wife, who left me six children, including a baby. I was having a hard time paying for food and school. One day [. . .] a friend gave me FBU 15,000 [USD 14] to start a business making ropes. People thought I had a lot of money. [One evening], armed robbers attacked my house. [. . .] They came in and asked for money. I gave them what I had, but they still shot me. I had a wound and a broken thighbone.

The following morning, people from the church took me to the Gitega hospital, where I spent several months. After a while, the nurses asked me for money even though I had nothing. After that, the nurses refused to treat me normally. My wound and broken bone got infected. No one wanted to change my bandages. The nurses put me away from the other patients in an isolated room as my wound was festering. [. . .] I was waiting for death.

—Testimony by Déo, aged 47, Burundi¹

There is more to armed violence than instant life or death for the individuals involved. Déo's experience illustrates how a weak public health system can eventually cost the wounded their lives. An entire family's well-being may also be deeply affected by the incapacitation of its main income provider.

This chapter examines the impacts of armed violence from an economic perspective by reviewing the medical costs of injuries; the productivity lost due to death, inactivity, and disability; and reductions in quality of life. It considers the following questions:

- How do the costs of gun violence compare to those of violence committed with other means, and what explains the difference?
- Which societies carry the highest costs?
- How can methodology be improved to increase our understanding of the global costs of gun violence?

Estimates of the costs of violence not only highlight the multiple effects of armed violence; they can also serve as key reference points for resource allocation and priority setting. In developed countries, high costs are frequently used to justify more spending on violence prevention. As Déo's case illustrates, however, developing countries that cannot afford to care for victims will probably spend less than they should. Comparing costs with levels of armed violence can thus help identify in which societies victims are the most vulnerable. The chapter's main conclusions are:

- Relatively low violence-related public health expenditures in developing countries do not necessarily mean that gun violence is less of a burden. Limited spending may actually point to unresponsive medical systems, which mean that gun injuries are less likely to be treated and more likely to be lethal.

- Small arms misuse accounts for an excessive proportion of the costs of violence. In Brazil and Colombia, the medical treatment of a firearm injury costs between 1.7 and 3 times more than that of a stabbing. Firearms injuries also tend to affect young, potentially productive segments of the population.
- The intent of small arms violence influences its lethality and cost. Accidental shootings and gun assaults are generally less fatal than suicide attempts, and therefore necessitate more medical expenses. On the other hand, premeditated killings and the high lethality of suicide attempts have important indirect effects, resulting, for instance, in significant losses of earnings.
- Misconceptions about the costs of violence abound, and methodologies need to be refined to gain a better understanding of the global costs of gun violence.

The chapter begins with an overview of the different types of costs and methodological approaches considered in the literature on the burden of violence. The second section focuses on the contribution of firearms to the overall costs of violence. It argues that a number of factors—including the nature of gun violence and the responsiveness of medical systems—are likely to influence the scope of the problem. The third section presents the results of three pilot studies that compare the costs of violence perpetrated with firearms and sharp instruments in Bogotá and Cali (Colombia), and Rio de Janeiro (Brazil). These studies followed draft methodological guidelines developed by the Small Arms Survey for the World Health Organization (WHO) and the US Centers for Disease Control and Prevention (CDC).

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All monetary results in this chapter have been converted to 2003 purchasing power parity (PPP) USD (hereafter PPP USD).² PPP values account for price differences across countries, allowing international comparisons of real output and incomes. PPP USD 1 has the same purchasing power in the domestic economy as USD 1 has in the United States.³

THE COSTS OF VIOLENCE: TYPOLOGIES AND COMPARABILITY ISSUES

Defining and ordering the various types of costs of violence following a coherent approach is essential for generating meaningful comparisons. This section introduces a framework to conceptualize the various costs associated with violence, drawing from previous work conducted by the Small Arms Survey and others.⁴ It further highlights difficulties in comparing existing estimates due to the lack of a standardized methodological approach. When reviewing knowledge to date, the section also introduces a distinction between collective violence (i.e. conflict) and societal violence. The latter includes interpersonal violence—or violence that is directed against another person, such as assaults—and self-directed violence, including suicide attempts and self-mutilation.⁵

What types of costs?

Any attempt to highlight the impacts of violence must recognize that violence affects societies at all levels, as opposed to only victims and perpetrators. Accordingly, studies documenting the economic effects of violence have covered a broad range of costs (Table 8.1).

Analysts commonly make a distinction between direct and indirect costs.⁶ Direct costs are those that arise directly from acts of violence and require actual payments by individuals or institutions. They can be further divided

Table 8.1 A typology of the costs of violence

Cost category	Type of cost	Components
Direct costs	Medical	In-patient costs (hospitalization, surgery, physician fees, drugs, laboratory tests) Out-patient costs Rehabilitation Ambulance fees
	Non-medical	Costs of policing and incarceration Costs of legal services Direct perpetrator control costs Costs of foster care Private security contracts Post-conflict reconstruction costs Care provided to displaced people
Indirect costs	Tangible	Productivity losses (earnings and time) Lost investments in social capital Life insurance costs Indirect protection costs Macroeconomic costs (reduced production, property values, tourist streams, and foreign investment)
	Intangible	Health-related quality of life (pain and suffering, psychological costs) Other quality of life (reduced job opportunities, access to schools, public services, and participation in community life)

Sources: Adapted from WHO (2004a, p. 6); Lindgren (2005, p. 5)

into medical and non-medical costs, given the importance the literature has given to documenting the costs of medical treatment (see WHO, 2004a; Waters et al., 2005). Direct medical costs generally comprise in-patient costs, including costs of hospitalization and surgery, physician fees, drugs, and laboratory tests; and the costs of out-patient visits, rehabilitation, and ambulance fees. Direct non-medical costs include those incurred by the criminal justice system, such as costs of policing and incarceration, legal services, direct perpetrator control, foster care, and private security contracts. In the case of conflict, the costs of rebuilding destroyed infrastructure and providing care to displaced people can be included (Lindgren, 2005, p. 5).

Indirect costs refer to lost resources and opportunities resulting from violence. Studies tend to focus on tangible costs such as reduced productivity or output. Other tangible costs include lost investments in social capital (e.g. the cost of education of the victim and perpetrator), life insurance costs, reduced productivity or output by the perpetrator, and macroeconomic costs (e.g. reduction in production, property values, tourist streams, and foreign investment due to violence and conflict). Also included are intangible costs such as reductions in quality of life. Generally speaking, quality of life includes many components such as job opportunities, access to schools, public services, and participation in community life. In the context of violence, it is usually associated with health-related quality of life, which includes the pain and suffering, both physical and psychological, that arise from violent incidents.

In sum, direct costs represent the actual economic burden imposed on society and indirect costs represent the potential loss in resources. Both direct and indirect costs are of concern, because they represent forgone monetary value to society that could have been invested in positive projects.



A Las Vegas coroner points at autopsy X-rays of self-inflicted gunshots in January 2004.
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Methodological approaches

Methodological approaches to quantify the costs of violence include *modelling*, *willingness to pay*, and *accounting*. Analysts seeking to document the economic impact of conflict have developed modelling techniques to determine how the economy could have developed in the absence of war (Lindgren, 2005, p. 4). This is done by comparing a conflict-affected country's gross domestic product (GDP) both to its pre- and post-war economic trends, and to the GDPs of similar countries—such as its neighbours—not affected by conflict. The differences will generate an estimate of the costs of conflict, which are usually measured in reductions of annual growth or investment. Modelling techniques can be useful for the study of conflict, but are more difficult to apply to the study of societal violence. Levels of interpersonal and self-directed violence are relatively stable when compared to conflict, which hinders the analysis of their impact before, during, and after violence.

Willingness to pay assumes that the cost of a violent incident is the total sum of what individuals are willing to pay for reducing the risk of becoming a victim. This approach, when properly designed, can capture direct treatment costs, indirect costs, and costs associated with pain and suffering. There are three ways to estimate willingness-to-pay values. One is through surveys of individuals' willingness to pay to avoid a given problem in hypothetical situations. The second involves observing 'averting behaviour'; i.e. actual cases where individuals undertake preventive measures to avoid exposure to or mitigate the effects of violence. Investments made in preventive measures are then used as a proxy for individual willingness to pay to avoid violence. The third way involves examining court decisions on damage payments. While willingness to pay has the potential of generating a more comprehensive picture of the indirect costs of violence, it remains to be tested in developing countries and conflict situations.

The accounting approach involves counting and adding up a selection of the costs identified above. This can be done by multiplying the number of violent incidents by the estimated average cost per incident, or by focusing on macro-level expenditures—both public and private—that may be linked to violence. Productivity losses are usually calculated by multiplying the time lost due to violence by the income that victims would be generating if they had not been injured. In the costing of conflict-related violence, indirect cost calculations will also include lost production and investment, and impacts on capital flows (Lindgren, 2005, p. 5).

While accounting produces relatively conservative estimates when compared with willingness-to-pay techniques, it remains the most common approach to date. Accounting estimates are also seen as more credible among non-specialists unfamiliar with economic models or survey methods (see Lindgren, 2005, p. 14), and are therefore likely to have a greater impact at the policy level.

Comparability issues

There are presently no standardized approaches to costing violence, resulting in wide-ranging and competing estimates among and even within countries. Comprehensive reviews of studies examining the costs of conflict and societal violence point to the lack of estimates that both use comparable methodological approaches and focus on the same set of costs.⁷

Reviewing 11 studies that provide 36 country-level estimates, Lindgren finds that civil war can account for anywhere between 0.3 per cent and 90 per cent of annual GDP (2005, p. 13). Different assumptions can result in dramatically different estimates, even for a single country. The estimated costs of civil war in Sri Lanka and Nicaragua, for instance, vary greatly. Depending on the person doing the costing, conflict in Sri Lanka cost 2.2–15.8 per cent of GDP per year. In Nicaragua, variations were even more pronounced: estimates range from 0.8 to 90 per cent of annual GDP (Table 8.2).

Table 8.2 Differing estimates of the cost of civil war for Sri Lanka and Nicaragua

Country	Author	Conflict years	Cost per year as % of GDP
Sri Lanka	Richardson and Samarasinghe (1991)	1983–88	11.3
	Grobar and Gnanaselvam (1993)	1983–91	2.2
	Harris (1997; 1999)	1983–92	8.8
	Kelegama (1999)	1983–94	10.9
	Arunatilake, Jayasuriya, and Kelegama (2001)	1984–96	10.8–15.8
Nicaragua	Fitzgerald (1987)	1980–84	15.4
	Stewart and Humphreys (1997)	1965–90	4.4
	DiAddario (1997)	1980–87	17.3–25.7
	Stewart, Huang, and Wang (2000)	1977–93	0.8
	Lopez (2000)	1978–79, 1981–88	90.0

Source: Adapted from Lindgren (2005, p. 13)

Analyses of the costs of societal violence can result in equally wide-ranging findings. In the United States, for example, figures for the direct medical costs of child abuse range from PPP USD 1,965 per child per year in Washington State to PPP USD 44,173 per child per year in West Virginia (Waters et al., 2005, p. 306). Estimates will also vary greatly depending on whether indirect costs are included.

Variations in estimates are accentuated across countries, as medical costs and wages are comparatively lower in low- and middle-income countries than in high-income countries. The average cost per homicide was estimated at PPP USD 55,000 in Cape Town, sharply lower than in Australia (PPP USD 910,000) or New Zealand (PPP USD 1,426,000).⁸ Analysts also face the challenge of measuring impacts on the comparatively large—yet unrecorded—informal economy.⁹ These lower costs, however, do not mean that violence is relatively less of a problem. On the contrary, rates of violent injuries are particularly high among developing countries (WHO, 2002, p. 11).

Estimates of the costs of societal violence also have limited geographical coverage, with studies being undertaken primarily in developed countries and Latin American states. This makes the global economic burden of violence more difficult to assess than that of road traffic accidents, for example, for which methodological guidelines have long been established (see TRL, 1995) and a large enough sample of comparable studies exists, allowing for worldwide and regional extrapolations (WHO, 2004b).

What do we know about the global costs of violence?

While methodological variations make it difficult to compare results across studies and settings, there is general consensus that violence imposes a significant economic burden

on societies affected by it. Economic models using conflict data sets make it possible to measure the average impact of conflict on a country's GDP. Drawing on data for 92 countries, 19 of which faced civil war, Collier concludes that countries affected by internal conflict experience an annual decline in their GDP per capita of 2.2 per cent relative to their counterfactual (Collier, 1999, p. 181). A subsequent study of 211 countries found that wars of this type caused an average 2.4 per cent reduction in annual growth (Hoeffler and Reynal-Querol, 2003, p. 19). Other studies that account for various costs of conflict at the country level have usually found that civil wars have an even greater economic impact, averaging 10 per cent of annual GDP (Lindgren, 2005, p. 13).

Societal violence can impose an equally alarming burden. Costs for low-income countries may be underestimated, due to the small number of cases reviewed and the difficulty of comparing lost wages and income with those of high-income settings (WHO, 2004a, p. 14). The available evidence does suggest, however, that developing countries suffer more from violence than the industrialized world. Given the continent's high exposure to violence, the most



A child cries on the coffin of her father, a policeman who died of gunshot wounds in Colombia in August 2003. © Efrain Patino/AFP/Getty Images

revealing comparative estimates originate from Latin America. A 1999 study, based on six country case studies, estimated that 20.9 per cent of Latin America's GDP was being consumed by violence in terms of destruction, diversion of resources, and loss of human and financial capital (Londoño and Guerrero, 1999, p. 3). By comparison, in the United States, despite relatively high rates of violence for an industrialized state, violence is estimated to cost between 3.3 and 6.5 per cent of GDP, even when including indirect costs such as lost earnings and psychological costs.¹⁰

Most studies demonstrate that direct medical costs represent only a small fraction of the total burden of violence, despite being the focus of the majority of studies. A study comparing six Latin American countries found that the direct non-medical costs of interpersonal and collective violence (including expenditures on police, security systems, and judicial services) exceeded medical costs across all case studies (Buvinic, Morrison, and Shifter, 1999, p. 20), with ratios of medical to non-medical costs ranging from 1:1.2 in El Salvador to 1:30 in Venezuela. Although it is difficult to compare indirect costs across settings, there is general agreement that indirect costs are much higher than direct costs (Waters et al., 2005, p. 305). This suggests that a comprehensive assessment of the impacts of violence should not focus only on direct expenditures to support victims and deal with perpetrators, but must also consider lost opportunities and the destruction of resources that would have otherwise been available in the future.

Studies have also sought to measure the cost of violence prevention initiatives when compared with their benefits—whether real or potential. A number of preventive interventions targeting child abuse, child crime, sexual and domestic violence, and crime in general were found highly cost-effective (see WHO, 2004a, pp. 28–29). Collier and Hoeffler conducted economic evaluations of five different instruments to prevent or reduce conflict by comparing their costs to their potential benefits (2004, pp. 21–22). They conclude that external military intervention under Chapter VII of the UN Charter was the most effective, and that aid—as part of conflict prevention, but not of post-conflict recovery—was the least.

Civil wars cause a 2.2 per cent reduction in annual growth in affected countries.

COSTING GUN VIOLENCE: AN OVERVIEW OF THE ISSUES

Small arms are a common instrument in both conflict and societal violence. Globally, they are estimated to be involved in 60–90 per cent of conflict deaths, 40 per cent of homicides, and 6 per cent of suicides (Small Arms Survey, 2005, p. 230; 2004, p. 175). Firearms are also a major vector in fatal injuries following conflicts and in countries affected by acute urban violence (Small Arms Survey, 2005, p. 270; CERAC, 2005, p. 74). This section discusses whether and how the use of such weapons has implications for the costs of violence, and outlines challenges and opportunities for advancing current knowledge of the global costs of gun violence.

The costs of gun violence

The literature on the contribution of small arms violence to conflict is nascent and provides only limited insights about the associated economic burden (see Small Arms Survey, 2005, pp. 228–65; ICRC, 1999). As small arms are involved in the overwhelming majority of conflict deaths, however, their contribution to the costs of conflict can only be significant. Studies examining the costs of gun violence generally adopt a public health approach and focus on the direct medical costs, productivity losses, and in a few cases the reductions in quality of life that can be attributed to societal gun violence. Geographical coverage is also extremely limited, with the majority of studies focusing on the United States. Rare exceptions include Canada, El Salvador, and South Africa.

Table 8.3 Average direct medical costs per firearm injury by severity, selected studies (2003 PPP USD)

Location and source	Sample	Year	Fatal	Serious (admitted)	Slight (emergency department only)
Canada (Miller, 1995, table 1)	National	1991	8,828 (CAD 8,591)	30,037 (CAD 29,228)	5,224 (CAD 5,083)
El Salvador (Paniagua et al., 2005, p. 191)	San Salvador (one hospital)	2003	n/a	5,500 + 370 per bed day	n/a
South Africa (Allard and Burch, 2005, p. 592)	Cape Town (one hospital), abdominal gunshot wounds only	2005	n/a	3,427 (ZAR 10,269)	n/a
US (Miller and Cohen, 1997, p. 335)	National	1993	25,038	35,202	5,987

Most studies outside the United States focus exclusively on the direct medical costs of hospitalized gun injuries (Tables 8.3 and 8.4). Even so, the estimated cost of treating one firearm injury between developed countries such as Canada and the United States can vary significantly. Unsurprisingly, unit costs appear to be significantly lower in developing countries such as El Salvador and South Africa.

Gun violence makes a significant contribution to the overall cost of violence. In the United States, the total costs of gun violence, including productivity losses and reduced quality of life, are estimated at PPP USD 115–144 billion per year (Table 8.4). In El Salvador, treating hospitalized firearms injuries consumes more than 7 per cent of the country's entire health budget (Paniagua et al., 2005, p. 191). Treating an abdominal gunshot wound in South Africa costs 13 times the government's per capita health spending (Allard and Burch, 2005, p. 591).

As with violence in general, the indirect costs of gun violence are significantly higher than direct medical costs (see Table 8.4). Cook and Ludwig (2000), using a willingness-to-pay survey, found that the total costs of gun violence in the United States amount to PPP USD 115 billion, which is much more significant than estimates taking into account only productivity losses and direct medical costs (less than PPP USD 35 billion; see Table 8.4). Direct to indirect costs ratios can be highly inconsistent, however, even between similar countries. In Canada in 1991, productivity losses and reductions in quality of life were, respectively, 25 and 78 times more costly than direct medical costs (Miller, 1995, table 3). A US study found that productivity losses and reductions in quality of life were, respectively, 12 and 28 times higher than direct medical costs (Miller and Cohen, 1997, table 8). Overall, these findings suggest that the greatest costs of firearms violence are intangible and have to do with issues of reduced quality of life, pain and suffering, and psychological impacts that affect society as a whole.

Relatively few studies have tried to justify gun violence prevention strategies through cost-effectiveness analyses. Based on a willingness-to-pay survey, Ludwig and Cook (1999) estimate that the American public believed initiatives that would successfully reduce the number of gun injuries by 30 per cent would be worth spending PPP USD 27.3 billion, or PPP USD 860,000 per injury. In Jamaica, analysts calculated that if gunshot injuries admitted at Kingston Public Hospital were blunt instrument injuries instead, the hospital would be saving JMD 2.13–3.56 million (PPP USD 60,749–101,533) per year in medical costs (Zohoori et al., 2002, p. 260). In other words, an intervention that suc-

Table 8.4 Total annual direct and indirect costs of gun violence, selected studies (2003 PPP USD)

Location and source	Sample	Direct medical costs	Productivity losses	Quality of life
US (Cook and Ludwig, 2000, pp. 70, 79, 115)	National sample, 1997	0.5–2.1 billion	22.3–30.5 billion	Total direct and indirect costs of 114.6 billion*
US (Max and Rice, 1993, p. 171)	National sample, 1990	2 billion	2.3 billion for non-fatal injuries and 24.5 billion for fatal injuries	n/a
US (Miller and Cohen, 1997, p. 337)	National sample, 1992	3.4 billion	42.4 billion	98.5 billion
Canada (Miller, 1995, table 3)	National sample, 1991	65.2 million (CAD 63.4 million)	1.6 billion (CAD 1.6 billion)	5.1 billion (CAD 5 billion)
El Salvador (Paniagua et al., 2005, p. 191)	National, extrapolated from one hospital in San Salvador (admitted only)	13.2 million	n/a	n/a
South Africa (Allard and Burch, 2005, p. 593)	National, extrapolated from one hospital in Cape Town (admitted abdominal gunshot wounds only)	66.8 million (ZAR 200 million)	n/a	n/a

* Using willingness-to-pay method; figure therefore includes direct and indirect costs.

ceeded in limiting the use of guns in violence—even if the overall number of injuries remained steady—would trigger net savings for the medical system. In Canada, while the costs of the new gun registration system largely exceeded forecasts, available estimates of the costs of gun violence for the country make the investment look much more cost-effective (Box 8.1).

Box 8.1 Putting numbers in perspective: the costs of controlling firearms in Canada

Comprehensive schemes to regulate firearms are costly and the subject of considerably more debate than other interventions aimed at reducing injury and death. Canada has had relatively strict controls on handguns and required restricted weapons permits and registration to possess them since the 1930s.¹¹ In 1995 new legislation known as Bill C-68, supported by police and public health groups, introduced licensing to possess any firearm and registration of all firearms, and prohibited a wider range of semi-automatic firearms, along with short-barrelled handguns. The bill was hugely controversial as it was expensive to implement, but even so, it appears to be considerably more cost-effective than previously believed when considering possible savings in terms of firearms violence reduction.

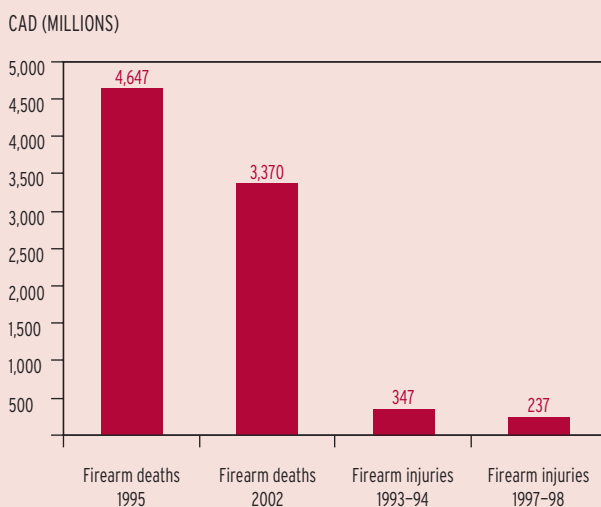
Since Canada passed Bill C-68 in 1995, the costs associated with licensing two million firearms owners and seven million firearms have dramatically exceeded initial estimates. Estimates in 1995 forecast a total additional cost for Bill C-68 of CAD 119 million (PPP USD 122 million), and the project anticipated collecting fees of CAD 117 million (PPP USD 120 million), a total additional net cost of CAD 2 million (PPP USD 2 million) (Canada, 2002).¹² In December 2002 the auditor general revealed that the firearms regulation programme would cost more than CAD 1 billion (PPP USD 0.85 billion) by 2004–05 (an average of CAD

100 million, or PPP USD 85 million per year) and collect only about CAD 140 million (PPP USD 119 million) in fees for the entire period since 1995 (Canada, 2002, para. 10.3).¹³ However, the auditor general did not comment on the appropriateness of the expenditure or the effectiveness of the legislation.

One of the challenges in evaluating the impact of firearms legislation is the gap between the passage of the law and its implementation. In the case of Bill C-68, for example, the law was passed in 1995, but the deadline for licensing all firearms owners was 2001 and that for registering all firearms was 2003. Consequently, an evaluation of the bill's final impact must wait several years.

Although it is too early to attribute this trend to the passage of the legislation, firearms deaths have declined dramatically from 1,125 (3.8 per 100,000) in 1995 to 816 (2.2 per 100,000) in 2002, the last year for which there is data (Wilkins, 2005, p. 42). The most pronounced changes are in youth firearms suicide rates (Wilkins, 2005, p. 38). Firearms suicide and homicide rates

Figure 8.1 Estimated total annual costs of fatal and non-fatal gun violence in Canada (millions of 1993 CAD*)



Sources: Firearms injury and death data: Cukier and Sidel (2005); Hung (2005); Wilkins (2005); costing figures: Miller (1995, Table 1)

Note: * 1993 CAD 1 = 2003 PPP USD 1.03

decreased more rapidly than non-gun suicide and homicide rates, suggesting that the legislation may be a contributing factor, and that the substitution effect was only partial. Firearms injury information is not available beyond Fiscal Year (FY) 1997-98. At that time, there was a significant decline in injuries requiring hospitalization during the period as well: from 1,125 (3.9 per 100,000) in FY 1993-94 to 767 (2.6 per 100,000) in FY 1997-98, a reduction of 32 per cent (Hung, 2005). While other factors besides legislation contribute to changes in firearms death rates, mortality and morbidity figures suggest stronger controls do contribute.¹⁴

Discussions to date generally focus on the costs of the legislation rather than its impact on the costs of firearms death and injury, even though these costs dwarf the investment of CAD 100 million (PPP USD 85 million) per year.¹⁵ A 1995 study, for example, finds that gunshot wounds occurring in 1991 amounted to CAD 55.3 million (PPP USD 56.8) in direct medical costs, CAD 8.1 million (PPP USD 8.3 million) in mental health care, CAD 1.55 billion (PPP USD 1.59 billion) in lost productivity, and CAD 4.97 billion (PPP USD 5.1 billion) in lost quality of life, for a total cost of CAD 6.6 billion (USD PPP 6.8 billion) in 1993 CAD (Miller, 1995, table 3).

So how much did Canada gain for its CAD 100 million (PPP USD 85 million) annual investment in comprehensive firearms regulation? It is too early to say. On the basis of Miller's costing study (1995), however, the savings due to the decline in firearms injuries since 1995 appear to be significant. Applying Miller's cost estimates to available firearm mortality and morbidity data highlights the amplitude of potential savings. In 2002 the annual costs of fatal gun violence were potentially reduced by 1993 CAD 1.3 billion (PPP USD 1.3 billion) when compared with 1995. The costs of non-fatal gun violence also decreased dramatically, saving Canada some 1993 CAD 110 million (PPP USD 113 million) in FY 1997-98 when compared with FY 1993-94. In sum, the potential benefits of new legislation in terms of violence prevention and reduction far outweigh its implementation costs.

Source: Cukier (2005)

Do small arms contribute disproportionately to the costs of violence?

Violence committed with firearms generates higher costs than violence committed with other instruments. In Cape Town, South Africa, for instance, injuries due to sharp objects, such as stabbings, accounted for 43 per cent of homicides, while firearms accounted for 39 per cent. Stabbings and firearms were each responsible for 43 per cent of the total economic costs of violence (including direct medical costs and productivity losses), however, suggesting that firearms homicides were more costly than homicides committed with knives (Phillips, 1998, table 11). As Max and Rice sum up, ‘firearm injuries are relatively more costly compared with both other injuries and other illnesses in general’ (Max and Rice, 1993, p. 183).

The seriousness and lethality¹⁶ of firearms violence result in significant indirect costs. As Table 8.5 illustrates, the average productivity losses and quality of life reductions attributed to an injury are much higher for deaths than for non-fatal injuries. This is because non-fatal injury survivors, although deeply affected, will be able to return to a productive activity and to their communities and families after recovery in a majority of cases. The proportion of gun injuries that are lethal is much higher for firearms than for cut/stab wounds, which increases their overall costs. In the United States, more than one in every five hospitalized firearms injuries results in death, while the ratio for cut/stab wounds is of one death for every 759 injuries (Miller and Cohen, 1997, table 7). Consequently, the average gunshot injury in the United States will cost PPP USD 937,000 compared to just PPP USD 19,000 for a cut/stab wound, a ratio of almost 50 to 1. When considering only non-fatal injuries, gunshots cost PPP USD 196,000 per victim versus PPP USD 14,000 for cuts and stabbings, a ratio of 14 to 1 (Miller and Cohen, 1997, p. 335).

The relative cost of gun injuries depends greatly on intent. Average direct medical costs per injury are generally higher for unintentional shootings (PPP USD 25,670) and interpersonal injuries (PPP USD 21,086) than for self-

Table 8.5 Average costs per gunshot and cut/stab wound in the United States, by severity and category of cost (2003 PPP USD)

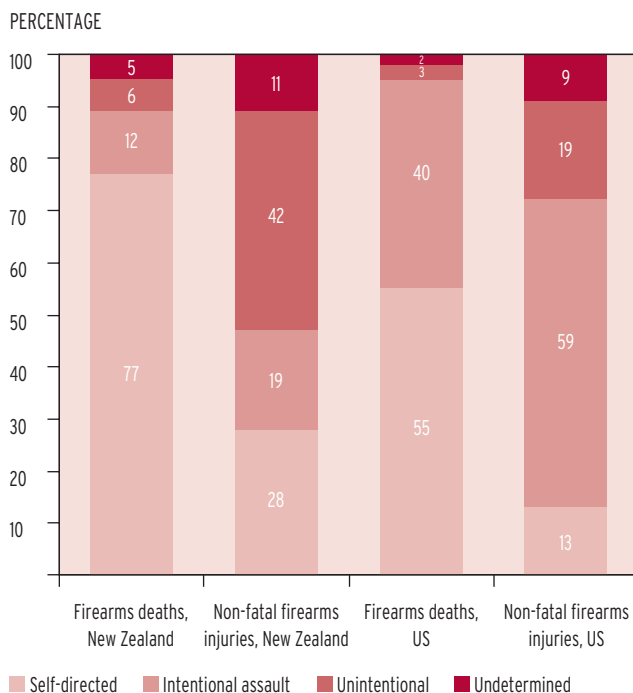
Cost category	Gunshot wound			Cut/stab wound		
	Fatal	Hospitalized	Emergency department only	Fatal	Hospitalized	Emergency department only (intended)
Direct medical*	25,038	35,202	5,974	25,038	21,059	3,723
Direct non-medical**	3,631	3,446	1,169	3,631	1,946	661
Productivity lost	1,166,767	56,255	2,617	1,249,487	41,478	2,351
Lost quality of life	2,370,841	222,823	82,763	2,444,691	193,538	34,378
Total	3,566,277	317,726	92,523	3,722,847	258,021	41,113

* Includes medical care, mental health care, and emergency transport.

** Includes police services and insurance administration.

Source: Adapted from Miller and Cohen (1997, table 4)

Figure 8.2 Distribution of firearms deaths and hospitalized injuries by intent in New Zealand (1992–96) and the United States (1996–98)



Source: Adapted from Spicer et al. (2005, p. 72)

inflicted injuries (PPP USD 6,200) (Cook and Ludwig, 2000, p. 65). As victims of firearms suicides die almost instantly, settings where a high proportion of firearms deaths are due to suicide will experience relatively fewer non-fatal firearms injuries than countries where the majority of deaths are due to gun homicides or accidents. Even where firearms suicides represent the majority of firearms deaths, injuries due to assaults and accidents involving firearms account for the vast majority of hospitalized injuries (Figure 8.2). High levels of unintentional and assault-related gun violence should therefore result in significant medical costs. When taking into account indirect costs (productivity losses and reduced quality of life), however, self-inflicted injuries generate the highest average costs, as they most often result in the death of the victim (Miller and Cohen, 1997, table 5).

Implications for the global costs of gun violence

Given the disparate nature of existing data, it is exceedingly difficult to render a global estimate of the economic burden of violence, much less gun violence. Generating a comprehensive estimate of the global costs of societal gun violence will require expanding the existing sample of country-level estimates, which remains too limited. The available evidence does make it possible, however, to generate a broad picture of which regions may suffer the greatest burden.

Costing usually involves multiplying the number of violent incidents by average unit costs. The number of firearms deaths and injuries is therefore seen as important information for producing a global cost estimate.

Although considerable gaps remain, knowledge about the global and regional distribution of fatal gun violence by intent is increasing.¹⁷ The global incidence of non-fatal firearm injuries is less well documented. As discussed above, however, the intent of firearms violence—which is better documented worldwide—influences the lethality of gun injuries and thus the ratio of deaths to survivors of armed violence.

Contexts where violence is meant to be lethal experience relatively fewer gun injuries, which has implications for the costs incurred by such violence. In Bogotá, Colombia, the high lethality of firearms wounds has been attributed to the ‘professionalizing’ of violence—reflecting the large numbers of targeted, premeditated assassinations—and there is a high proportion of particularly lethal head and abdomen wounds (Beltrán et al., 2003, p. 12). Similarly, in conflict situations, there are few survivors when firearms are used against people who are immobilized, in a confined

space, or unable to defend themselves (Coupland and Meddings, 1999). Settings where a high proportion of gun violence is self-directed—such as North America—will also suffer relatively fewer non-fatal firearms injuries. In such contexts, the low numbers of injuries will translate into relatively low medical costs, while the indirect costs associated with mortality will be high.

Countries experiencing high levels of interpersonal gun violence—such as those in Latin America or Africa—should, theoretically speaking, be caring for large numbers of non-fatal injuries in their hospitals. Additional factors come into play, however. As Table 8.6 illustrates, gun injuries in Brazil and Colombia appear to be more lethal than in developed countries with high gun suicide rates such as Canada and the United States.¹⁸ This may be the result of a strong intent to kill, as discussed above. It may also point to relatively unresponsive emergency medical systems in developing countries, which make firearms wounds less likely to be treated and more likely to be lethal. In such settings, victims of firearms violence may also refrain from going to hospitals, as they will be unable to pay for treatment. Medical expenditures therefore risk being lower than they should be among developing countries.

Table 8.6 Incidence of firearms injuries, by severity

Location and source	Sample	Year	Total fatal	Serious (admitted but survived)	Slight (emergency department only)	Ratio total fatal: serious	Ratio serious: slight	Ratio total fatal: non-fatal
Brazil*	National	2002	38,088	17,793	n/a	1:0.5	n/a	n/a
Canada (Miller, 1995)	National	1991	1,450	1,244	3,031	1:0.9	1:2.4	1:2.9
Colombia**	National	2005	14,762	5,546	n/a	1:0.4	n/a	n/a
El Salvador (Paniagua et al., 2005)	National	2003	1,697	2,580	n/a	1:1.5	n/a	n/a
US (Miller and Cohen, 1997)	National	1992	37,776	61,300	72,700	1:1.6	1:1.2	1:3.5
El Salvador (Paniagua et al., 2005)	One hospital (San Salvador)	2003	n/a	623	789	n/a	1:1.3	n/a
Nigeria (Solagberu, 2003)	One hospital (Ilorin)	September 1999–October 2001	n/a	27	39	n/a	1:1.4	n/a

*Brazilian Ministry of Health data processed by Instituto de Estudos da Religião (ISER), provided in written correspondence by Luciana Phebo of ISER, 8 December 2005.

** Colombian National Police data processed by Centro de Recursos para el Analisis de Conflictos (CERAC), provided in written correspondence by Katherine Aguirre of CERAC, 8 February 2006.

Estimating the costs of gun violence in different settings will, therefore, not only increase our understanding of the global scope and nature of gun violence, but will also highlight important policy deficiencies. Comparing rates of violence with public health expenditures, in particular, can help identify where victims are the most vulnerable. While most costing literature has been used to justify increased spending on prevention in developed countries, it also offers the opportunity for low- and middle-income countries to determine whether the victims of gun violence are appropriately taken care of.



COSTING FIREARM VIOLENCE IN BRAZIL AND COLOMBIA

Working with the WHO and CDC, the Small Arms Survey has prepared a unique set of standardized guidelines to estimate the direct and indirect economic costs of interpersonal and self-directed violence (see Annex 1 for an overview). The guidelines aim to enable low- and middle-income countries to generate robust estimates despite sometimes incomplete data. In order to test the applicability of the guidelines, the Small Arms Survey independently commissioned pilot case studies in Brazil (Rio de Janeiro) and Colombia (Bogotá and Cali) to measure the specific contribution of firearms to costs, as opposed to other means of violence.

The case studies reached conclusions that are consistent with those of similar costing work carried out in the United States and Canada. Extrapolated nationally, firearms injuries cost Brazil and Colombia's respective medical systems PPP USD 88 million (BRL 100 million) and USD 38 million (COP 29 billion) a year. The medical treatment for the average gunshot wound was between 1.7 and 3 times more expensive than that required for treating cuts or stabs, ranging

A gunshot victim lies on a stretcher in Bonsucesso Hospital in Rio de Janeiro in January 2005.
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from PPP USD 4,500 to PPP USD 11,500 per injury. These average medical costs appear relatively consistent with those of other developing countries—i.e. El Salvador and South Africa—as reported in Table 8.3.

Interestingly, however, average medical costs were more expensive in both Colombian hospitals than in Rio de Janeiro, which is counterintuitive, as the standard of living—as measured by GDP per capita—is higher in Brazil than in Colombia (see UNDP, 2005). This may be partly due to the different price scales used to measure the costs of treatment. In Brazil, a national scale was used, while in Colombia, individual bills submitted to the public health system formed the basis of the estimate. Another explanation may be that the Brazilian public health system may not be as well equipped to deal with violent injuries as its Colombian counterpart. This explanation is supported by the fact that a greater proportion of victims died from their wounds in the Brazilian hospital than in the Colombian facilities.

Victims of firearms violence also lost more productive time than victims of violent cuts and stabs. Survivors of gun violence spent more days in hospital and were expected to remain inactive while convalescing longer than patients injured by sharp instruments. Consistent with other research on the victims of small arms violence (ANGRY YOUNG MEN), a particularly high proportion of patients treated for gun injuries were young men. This translates into considerable lost earnings, particularly as the average income earned in Brazil and Colombia is higher among men than women. When extrapolating results using national mortality and morbidity data, gun violence is threatening PPP USD 10 billion of future earnings (BRL 11.3 billion) in Brazil per year, and PPP USD 4 billion (COP 3,100 billion) in Colombia.

Methods and sampling

The pilot case studies involved surveying victims of violent injuries in key hospitals in both countries. These included the Hospital da Geral in Nova Iguaçu (HGNI), Rio de Janeiro, Hospital Santa Clara (HSC), Bogotá, and Hospital Universitario del Valle (HUV), Cali (see Table 8.7). Two local research institutes, ISER in Brazil and CERAC in Colombia, administered the field research. Drawing explicitly from the Small Arms Survey guidelines, the research teams elaborated standardized questionnaires to prospectively gather information from each victim of a violent act seeking care at the selected hospitals during a one-month period (12 November–12 December 2005).¹⁹

The research teams collected a wide variety of data, including, among others, information on the patient's demographic and socio-economic profile, the characteristics and severity of the injury, the type of care provided, and associated medical costs. In Brazil, costs for each type of treatment were calculated based on the Brazilian Medical

Table 8.7 Distribution of violent injuries by instrument, 12 November–12 December 2005

Instrument	HGNI, Rio de Janeiro	HSC, Bogotá	HUV, Cali
Firearm	25 (23%)	28 (19%)	71 (61%)
Sharp instrument	13 (12%)	83 (57%)	45 (39%)
Blunt instrument	68 (61%)	15 (10%)	0
Poisoning	2 (2%)	14 (10%)	0
Unspecified	3 (3%)	5 (3%)	0
Total	111 (100%)	145 (100%)	116 (100%)

Source: Small Arms Survey calculations based on ISER (2006b); CERAC (2006c)

Association payment scale and interviews with HGNI and Rio Fire Department personnel (ISER, 2006a; 2006b). In Colombia, costs were calculated based on the final medical expenses that hospitals sent to the public medical system for each patient (CERAC, 2006a).²⁰ Values are presented in 2003 PPP USD.²¹

Preliminary findings

All three pilot studies confirmed that firearms injuries trigger higher medical costs than injuries inflicted by bladed weapons. As Table 8.8 shows, the average gun injury cost the surveyed hospitals between 1.7 and 3 times more than a cut/stab wound. Treating the average firearm injury in Rio costs seven times Brazil's per capita public health spending; in Bogotá and Cali the costs of treating a single firearm injury reach 13 and 21 times Colombia's per capita medical expenditures.²²

Predictably, the substantially higher medical costs of firearms injuries are primarily the result of their relative severity. Among the 12 patients that died on their way to or in the hospital as a result of their wounds, 10 were shot, while only 2 had been cut or stabbed. As Table 8.9 illustrates, in all three hospitals, the average length of stay (days spent in hospital) and the percentage of patients requiring blood transfusions were higher for victims of firearms violence than for those injured by bladed weapons.

A greater proportion of victims with firearms wounds in Rio required surgery than those wounded by sharp instruments, and operations lasted on average 1.5 hours longer. While fewer victims of firearms violence underwent surgery in Bogotá, operations were more complex for firearms wounds and cost the hospital on average 1.2 times more. Intriguingly, in both Colombian hospitals, a greater proportion of patients wounded by a bladed weapon used an ambulance than firearms violence victims.²³

Table 8.8 Average medical costs per injury by instrument (2003 PPP USD)

	HGNI, Rio de Janeiro		HSC, Bogotá		HUV, Cali	
	Firearm	Sharp instrument	Firearm	Sharp instrument	Firearm	Sharp instrument
Ambulance	219	119	111	129	176	229
Bed*	2,044	702	0	0	2,470	1,355
Consultations	82	58	108	79	362	222
Examinations	195	161	681	337	1,229	384
Surgery	845	372	1,932	1,602	3,323	2,427
Medication	1,074	85	1,739	563	3,839	1,004
Transfusions**	37	8	0	0	0	0
Other*	24	24	2,233	1,291	4	7
Total	4,521	1,529	6,804	4,001	11,403	5,628

* In Bogotá, bed costs are included under 'Other'.

** In Bogotá and Cali, the costs of transfusions are included in other costs, such as those of surgery.

Source: Small Arms Survey calculations based on ISER (2006b); CERAC (2006c)

Table 8.9 Where do firearms make a difference?

	Instrument	HGNI, Rio de Janeiro	HSC, Bogotá	HUV, Cali
% deaths in hospital	Firearm	28	11	0
	Sharp instrument	0	2	0
% patients who used an ambulance	Firearm	44	32	51
	Sharp instrument	23	37	67
Average length of stay	Firearm	6.7	6	11
	Sharp instrument	2.3	4	5.2
% patients requiring consultations with specialists	Firearm	100	75	94
	Sharp instrument	96	57	96
% patients requiring examinations or tests	Firearm	80	93	99
	Sharp instrument	85	87	89
% patients requiring surgery	Firearm	52	75	100
	Sharp instrument	15	85	100
% patients requiring medication	Firearm	80	96	100
	Sharp instrument	92	95	100
% patients requiring blood transfusions	Firearm	32	25	37
	Sharp instrument	8	19	33
Estimated number of inactive days	Firearm	23	30	32.5
	Sharp instrument	7.8	21.5	22.1
Percentage permanently disabled	Firearm	8	4	10
	Sharp instrument	0	0	7
Average age of patient at time of injury (average number of productive life years lost)*	Firearm	28 (38)	29 (37)	28 (38)
	Sharp instrument	24 (42)	30 (36)	30 (36)
Percentage men	Firearm	90	96	96
	Sharp instrument	75	85	93

Note: Figures in red indicate instrument with worst impact.

* Assuming people can be 'productive' until the age of 65 in both countries.

Source: Small Arms Survey calculations based on ISER (2006b); CERAC (2006c)

Several key indicators were identified in the three pilot studies to evaluate the productivity losses of victims of violence. These include the number of days spent in hospital, the number of days they cannot work as they recover, and the number of productive life years lost due to death or disability. The surveys allowed for a comparison of the number of days spent in hospital, as well as the average ages of victims. Given the relatively short time frame of the pilot studies, however, the number of inactive days and the proportion of disabled patients are based primarily on

Table 8.10 Average productivity losses per injury, by severity and instrument (2003 PPP USD)*

	HGNI, Rio de Janeiro		HSC, Bogotá		HUV, Cali	
	Firearm	Sharp instrument	Firearm	Sharp instrument	Firearm	Sharp instrument
Non-fatal						
Time spent in hospital	265	83	196	124	360	168
Inactivity after discharge	910	281	982	664	1,063	712
Total non-fatal	1,175	364	1,178	788	1,423	880
Fatal or permanently disabled	325,045	311,406	268,835	250,291	272,779	260,823

* Productivity losses were calculated using the average PPP USD income for women and men in Brazil and Colombia, as reported in UNDP (2005). Figures also take into account informal economy income, which is estimated at 39.8 per cent of gross national product (GNP) in Brazil and 39.1 per cent in Colombia (Schneider, 2002, p. 11). Average income figures were then applied according to the gender distribution of victims treated at each selected hospital. For comparative purposes, researchers assumed that people are productive until age 65 in both Brazil and Colombia when calculating years of productive life lost due to death or disability. For productivity losses due to death or disability, a 3 per cent discount rate was applied (see Annexe 1).

Source: Small Arms Survey calculations based on ISER (2006b); CERAC (2006c); UNDP (2005); Schneider (2002)

Table 8.11 Extrapolated total costs of/losses from gun violence for Brazil and Colombia (2003 PPP USD)

Type of injury	Number of cases and type of cost	Brazil	Colombia
Non-fatal (admissions only)	<i>Number of cases (year)</i>	19,534 (2002)	5,546 (2005)
	Average medical costs	4,521	6,804
	Total medical costs	88,309,893	37,735,821
	Average productivity losses	1,175	1,178
	Total productivity losses	22,953,094	6,532,010
	Total non-fatal costs	111,262,987	44,267,831
Fatal	<i>Number of cases (year)</i>	30,855 (2002)	14,762 (2005)
	Average productivity losses	325,045	268,835
	Total fatal non-hospitalized costs	10,029,249,309	3,968,538,684
Total	Total medical costs	88,309,893	37,735,821
	Total productivity losses	10,052,202,404	3,975,070,694
	Total	10,140,512,297	4,012,806,515
	Total as % of national income*	0.5	1.0

* Percentage of national income calculated from PPP USD GDP figures (from UNDP, 2005) and the estimated ratio of informal income to GNP as reported in Schneider (2002, p. 11).

Sources: Costing data: Tables 8.6., 8.8., and 8.10 (for Colombia, average costs are those of HSC, Bogotá)

doctors' estimates at the time the victim was still at the hospital. The figures presented in Table 8.10 are therefore exploratory and would benefit from the further monitoring and surveillance of patients after discharge.

It appears that firearm injuries nevertheless generate higher productivity losses than cut/stab wounds in all pilot case studies. This is primarily because in most cases, victims of firearms violence lost more productive time (Table 8.10). In addition, a greater proportion of gun violence victims were men, for whom average earned income was also higher in both countries (see UNDP, 2005). This raises the importance of including the value of unpaid productive activities such as housework in such estimates, for which data was unfortunately not available for these pilot studies.

Implications for the costs of gun violence in Brazil and Colombia

Findings on the direct medical costs and productivity losses at the selected hospitals make it possible to produce a rough estimate of the costs of gun violence at the national level in Brazil and Colombia. Multiplying the number of fatal and non-fatal injuries by the average cost per injury illustrates the significance of the problem. Non-fatal injury data for Brazil and Colombia is incomplete, however, and only covers admitted patients. Actual medical costs would therefore be higher if they included information on patients receiving care at emergency departments.

Based on the available data, firearms injuries cost Brazil and Colombia's medical systems a combined PPP USD 125 million a year. Productivity losses are much more significant: they amount to PPP USD 10 billion a year in Brazil and PPP USD 4 billion in Colombia. When these two cost categories are combined, the costs of gun violence in Brazil and Colombia amount to 0.5 and 1 per cent of their respective annual national income.

Annual productivity losses amount to PPP USD 10 billion in Brazil and PPP USD 4 billion in Colombia.

CONCLUSION

Examining the impacts of gun violence from an economic perspective can serve as an essential component in the design, monitoring, and evaluation of violence prevention and reduction initiatives. It highlights how every gunshot wound has implications that go far beyond victim and perpetrator, and thus helps justify investment in gun violence prevention and reduction. Small arms violence affects society as a whole, inflicting material costs to survivors, family, and institutions; jeopardizing future output and productivity; and affecting mindsets and well-being.

Unfortunately, very few estimates of the costs of gun violence exist. Existing studies also have different purposes, do not focus on the same costs, rely on methods that have not yet been standardized, and result in findings that are difficult to compare. Systematic data gathering on the costs of gun violence, particularly in developing countries, would represent a significant step forward in our understanding of the impacts of small arms violence.

Despite these limitations, there is ample evidence that small arms make violence worse for societies by increasing the average cost of violent injuries. Small Arms Survey pilot studies in Brazil and Colombia confirm that this is not only the case in developed countries, but applies in other regions. Medical costs are significantly higher for gunshot wounds than for other violent injuries, and victims of gun violence are younger than the average victim of violence, resulting in many lost opportunities.

Countries and regions pay very different price tags, however. Indirect costs such as lost earnings are particularly high among countries affected by highly lethal forms of gun violence, such as assassinations, mass killings, and suicides. The total medical costs of gun violence in low- and middle-income countries tend to be lower than their high levels of small arms violence might suggest. In such settings, costing studies can help identify insufficiencies in

poorly resourced medical and rehabilitation systems. Improving the responsiveness of public health systems to gun violence is crucial, as it will both decrease the victims' suffering and increase their probability of surviving their wounds. ■

ANNEXE 1. MEASURING THE COSTS OF FIREARMS VIOLENCE: A MODEL

The Small Arms Survey, together with the WHO and CDC, is currently developing guidelines to estimate the economic costs of violence. The model is meant to enable researchers to generate estimates in developing countries. The basic formula for arriving at an estimate is the following:

$$\text{Total costs} = \text{number (incidence) of violent incidents} \times \text{average unit cost per incident}$$

The costs considered include direct medical costs and loss of productivity due to injury and death. While this approach does not take into account all the costs incurred by small arms violence, it is particularly valuable to the study of firearms violence. Indeed, these cost categories help highlight the disproportionate costs of gun violence when compared with other forms of violence, as firearms injuries require more intensive medical treatment and generally affect young, potentially productive segments of the population.

Obtaining incidence data

For fatal violence, the absolute minimum data required to produce an economic cost estimate should include the total number of violence-related deaths available for the study area and the average age at death of the victims. A more meaningful estimate will be produced when the data is disaggregated by intent, age, and sex of the deceased and instrument of injury (for our purposes, firearms vs. other weapons).

Data on the incidence of non-fatal violence will generally be much more difficult to obtain than data on violence-related deaths. Hospitals are likely to be the most readily accessible source of data, but will only reflect incidents leading to injuries that result in hospital treatment. Rapid assessment procedures for estimating the total number and incidence of violence-related injuries, irrespective of severity, seen in hospitals, may be required (see Matzopoulos et al., forthcoming).

Obtaining costing data

In a majority of countries, even the minimum required costing data will probably not be available from an existing source. It will therefore be necessary to generate the costing data by studying costs for violence-related injuries treated in a small sample of facilities.

The first step involves selecting one or several medical facilities that are believed to be generally representative of the area under study. Costing data may then be obtained from registers or patient surveys to be administered by hospital staff in addition to their usual paper records, or by a trained team of researchers. The sampling strategy used in this chapter's three pilot studies involves capturing data on approximately 100 patients as they present themselves at the hospitals.

The following minimum information should be collected for each violent injury treated at the facility:

- sex and age of the patient;
- injury intent (interpersonal, self-directed, collective, unintentional, undetermined);
- injury severity (emergency treatment only, hospitalization only, death);
- instrument used to inflict injury (firearm, bladed weapon, other);
- length of hospital stay in days;
- use of ambulance;
- operations carried out on the patient;
- drugs given to the patient during and after the stay;
- number of examinations (e.g. X-rays) carried out on the patient;
- number of blood transfusions given to the patient;
- number and type of physicians consulted during the stay;
- estimated number of days the patient will be convalescing (i.e. not be able to work) after leaving the facility; and
- estimated number of out-patient visits the patient will undertake after leaving the facility.

The last two items may be requested from the personnel treating the patient. If time allows, however, conducting follow-up interviews with patients after they leave the facility would be preferable and more accurate.

In addition, a certain number of unit costs need to be obtained from the facility personnel. These include:

- average 'hotel cost' per bed day (excluding drugs, operations, and physicians);
- average ambulance costs;
- costs of the various drugs identified;
- average cost per type of operation, examination, and blood transfusion;
- average cost per physician consultation; and
- average cost per out-patient visit.

Extrapolating results

Based on the sample of injuries surveyed, it is possible to calculate average medical costs per violent injury. These average medical costs are then multiplied by the total number of injuries treated in the area under study to generate a rough estimate of total medical costs. Average costs may also be disaggregated by severity of injury or, as is done in this chapter, by instrument used. The latter option will produce the most revealing insights regarding the cost of firearms injuries when compared with those of wounds caused by other weapons.

Lost productivity is calculated by multiplying the amount of productive time lost due to injury or death by average earnings. Time lost is calculated from the average age at death from a violent injury, as well as the average number of convalescing days among survivors. In this chapter, average earned income figures were obtained from UNDP (2005). Values were adjusted according to the gender distribution of the sample of patients. Figures also included estimated income generated through the informal economy, based on country ratios included in Schneider (2002). Ideally, however, researchers will seek to determine the average income of victims of violence, as they may originate from lower social classes. Future loss of productivity—i.e. that due to death or permanent disability—must also be discounted to give its present value (see Corso and Haddix, 2003). This chapter used a discount rate of 3 per cent per year.

Productivity losses can therefore be calculated using the following formulas.

For non-fatal injuries: *Losses = number of non-fatal injuries × average number of days lost × average daily earnings*

For fatal injuries: *Losses = number of fatal injuries × average annual earnings × discount factor*

Where: *discount factor = 1/0.03 – 1/[0.03 × (1.03)^a]* (where: *a = years lost = 65 – average age at death + 1*)

LIST OF ABBREVIATIONS

BRL	Brazilian real	HSC	Hospital Santa Clara (Colombia)
CAD	Canadian dollar	HUV	Hospital Universitario del Valle (Colombia)
CDC	Centers for Disease Control and Prevention (US)	ISER	Instituto de Estudos da Religião (Brazil)
CERAC	Centro de Recursos para el Analisis de Conflictos (Colombia)	JMD	Jamaican dollar
COP	Colombian peso	PPP	purchasing power parity
GDP	gross domestic product	USD	United States dollar
GNP	gross national product	WHO	World Health Organization
HGNI	Hospital da Geral in Nova Iguaçu (Brazil)	ZAR	South African rand

ENDNOTES

- Translated by the present author and adapted from MSF (2004, p. 3). Déo was eventually transferred to a free Médecins sans Frontières facility and survived. His case is not an isolated one, however. Many Burundians unable to pay their medical bills have been 'imprisoned' in hospitals (FIACAT, 2005). This situation prompted Françoise Ngendahayo, the Burundian minister in charge of national solidarity, to order the release of all such prisoners on 23 December 2005 (Netpress, 2005).
- Unless stated otherwise, PPP USD values were computed using PPP conversion rates and the US consumer price index as reported in IMF (2005), with 2003 as the base year.
- See UNDP (2005).
- See Small Arms Survey (2002, p. 159; 2003, p. 131), WHO (2004a, p. 6), and Lindgren (2005, p. 5).
- This typology is based on the WHO definition, which considers violence as '[t]he intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation' (WHO, 2002, p. 5).
- See Waters et al. (2005), WHO (2004a), Rice (2000), and Fleurence (2003).
- For a review of the limitations of existing studies, see Lindgren (2005), WHO (2004a), and Waters et al. (2005).
- Phillips (1998), Walker (1997), and Fanslow et al. (1997), as reported in Waters et al. (2005, p. 305).
- According to one study, the informal economy is equivalent to 42 per cent of GDP in Africa, 41 per cent in Central and South America, 29 per cent in Asia, 35 per cent in transition countries, 18 per cent in Western European Organization for Economic Co-operation and Development (OECD) countries, and 13.5 per cent in North American and Pacific OECD countries (Schneider, 2002, p. 45).
- Miller, Cohen, and Wiersema (1996); Miller, Fisher, and Cohen (2001); as quoted in WHO, 2004a, pp. 13–14.
- Over the past 30 years, a series of measures have progressively tightened controls over rifles and shotguns. In 1977 new legislation was introduced that required a Firearms Acquisition Certificate before purchasing rifles or shotguns. At the same time, fully automatic weapons were prohibited. In 1991 the screening processes associated with getting a Firearms Acquisition Certificate were tightened to include a range of risk factors associated with suicide and domestic violence. The 1991 bill also strengthened safe storage provisions and prohibited a wider range of military weapons, including semi-automatic variants.
- These were the estimated additional costs over and above those paid by the federal government for the operation of the existing system, including restricted weapons registry and transfer payments to provinces for the administration of the Firearms Acquisition Certificates, but did not consider other costs at the local level.

- 13 The audit notes that this estimate does not include all financial impacts on the government, and these were, according to the Department of Justice, due to ‘major delays in making regulations, provinces opting out of the Program, the need for additional initiatives, incorrect assumptions about the rate at which it would receive applications for licences and registrations, and an excessive focus on regulation and enforcing controls’ (Canada, 2002, para. 10.4).
- 14 Researchers have undertaken studies to assess the impact of previous changes to firearms laws in Canada. Leenaars and Lester (1997; 2001) examined trends in firearms deaths following the passage of the 1977 law. According to their studies, firearms homicide rates for victims aged 15–34 and 45–74 decreased significantly after the introduction of Bill C-51 in 1977. The studies find that the overall homicide rates decreased significantly after the introduction of Bill C-51, even when taking into account a series of social factors that include birth, marriage, divorce rate, unemployment rate, family income, and the percentage of males aged 15–21 in the population. In a subsequent study of suicide in Canada, Leenaars et al. (2003) find that firearms suicide rates decreased significantly after Bill C-51. In addition, the percentage of suicides by firearms also decreased significantly, although the impact on specific age groups and genders differed.
- 15 It is also important to contextualize the expenditures. The Province of Quebec spent CAD 125 million (PPP USD 106 million) to inoculate citizens against meningitis in 2002 after 85 cases were reported. New Brunswick invested CAD 485 million (PPP USD 413 million) in a segment of highway referred to as ‘Suicide Alley’ where 43 people had died over five years (unpublished letter, Antoine Chapdelaine et al., 10 January 2003). No one knows how much is invested to keep highways safe—be it through licensing drivers, registering vehicles, and operating safety programmes—but it is well into the billions of dollars annually.
- 16 Serious injuries in this chapter are those that require hospital admission, as opposed to receiving care only in emergency departments. Lethality refers to the proportion of injuries that result in deaths.
- 17 See Richmond, Cheney, and Schwab (2005) and Small Arms Survey (2004, pp. 172–211; 2005, pp. 228–65).
- 18 For evidence of these high gun suicide rates in Canada and the United States, see Small Arms Survey (2004, pp. 199–200).
- 19 Table 8.7 reveals the distribution of a sample of patients treated at HGNI (111 cases), HSC (145), and HUV (116). HGNI and HSC are both city hospitals that treat primarily patients coming from their surrounding area, which in many cases belong to poor social classes. HUV is the region’s largest referral hospital and treats primarily serious injuries. Thus it received a majority of patients injured by small arms (61 per cent), while the other two hospitals treated injuries caused by a wider range of instruments and included data on patients receiving emergency room treatment only. For comparative purposes, however, the analysis focuses on the costs of gunshot wounds versus those of sharp instrument injuries. In all cases where intent could be defined, firearms injuries were interpersonal. In all three hospitals combined, only 23 injuries were the result of suicide attempts and these involved sharp instruments (10 cases) or poisoning (13 cases), but no firearms.
- 20 Luciana Phebo of ISER, and Katherine Aguirre and Jorge Restrepo of CERAC also responded to numerous follow up queries in written correspondence, January–February 2006.
- 21 The rates used here were computed from UNDP (2005).
- 22 Using per capita public health expenditures as reported in UNDP (2005).
- 23 One plausible explanation is linked with the rapidity of reaction of Colombian ambulances. In Bogotá, for instance, it takes on average 11 minutes for an ambulance to reach an incident scene. Taxis, on the other hand, are easily available at every street corner. While a victim of a stabbing may be able to wait for an ambulance without endangering her/his life, a gunshot victim may be more likely to be rushed to hospital by taxi (written correspondence with Jorge Restrepo, CERAC, 13 February 2006).

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ACKNOWLEDGEMENTS

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Katherine Aguirre, Gustavo Álvarez, Wendy Cukier, Alexis Huynh, Carolina Idarraga, Jeadran Malagón, Cristina Nascimento, Luciana Phebo, Jorge Restrepo, and Guilherme Werneck.