A boy recovers in hospital from a bullet wound that has left him unable to recognize anyone and with no sensation on his left side, eastern Chad, 2007. © Corbis

A Matter of Survival
NON-LETHAL FIREARM VIOLENCE

3

INTRODUCTION

Not all gunshots kill. Many victims survive. This may sound like good news, but the consequences of firearm injuries can be severe. Treatment and recovery place a heavy burden on survivors, their families, communities, and society. Non-lethal firearm violence—often representing narrowly avoided homicide—is far more widespread than firearm death worldwide. Improved knowledge of the incidence and patterns of non-lethal firearm violence would clarify the overall burden of armed violence on society and underpin the development of effective responses. Yet our current understanding of non-lethal firearm injuries is limited, hampered by a lack of data.

This chapter reviews available data on the incidence of non-lethal firearm violence, focusing on interpersonal assaults committed in non-conflict settings.[1] It includes an overview of estimates for countries in which data collection is relatively robust. It also highlights the need for improved incidence and trend monitoring. The main findings indicate that:

- Worldwide, at least two million people—and probably many more—are living with firearm injuries sustained in non-conflict settings over the past decade. Their injuries generate considerable direct and indirect costs, such as those incurred through treatment, recovery, and lost productivity.
- Available data suggests that shooting victims in countries with lower overall levels of firearm violence have a better chance of surviving their injuries.
- Whether a firearm injury leads to severe disability or death is influenced by firearm type, ammunition velocity, and calibre, as well as the availability and quality of medical care, among other factors.
- Robust data on non-lethal firearm violence is still relatively uncommon, and collected data rarely conforms to standardized coding protocol, limiting its comparability. The use of simple forms and relatively inexpensive injury surveillance techniques would greatly improve available information.

This chapter has three main sections. The first introduces the concept of non-lethal firearm violence and associated terminology, explaining how the type of firearm and ammunition and the availability of medical care influence the survivability of gunshot injuries. The second section reviews data sources for non-lethal firearm violence, presents available information on the incidence of and trends in firearm-related injuries, and provides some estimates of direct and indirect costs. The third section reviews sample injury surveillance systems and highlights some of the challenges to improving data collection on non-lethal firearm violence. The conclusions offer reflections on how surveillance efforts might be improved, taking into account the importance of assisting developing countries in establishing well-designed data collection systems.

NON-LETHAL GUN VIOLENCE IN PERSPECTIVE

In the shadow of homicide

Tracking progress towards armed violence reduction requires accurate data to establish baselines and measure trends. Homicide represents a relatively robust indicator, since data is more readily available and presents fewer comparability problems than any other crime or violence indicator. A number of authoritative reports that assess international trends in violence make almost exclusive use of lethal violence data, including the *Global Burden of Armed Violence* and the *World Development Report* (Geneva Declaration Secretariat, 2011; World Bank, 2011). The extensive use of homicide statistics as a violence indicator has created additional demand for such data. Over the past few years both public health and criminal justice sources have become more accessible and complete. For example, the United Nations Office on Drugs and Crime (UNODC) recently published a *Global Study on Homicide* and the World Health Organization (WHO) is providing statistics on cause of death in its *Global Burden of Disease* (UNODC, 2011a; WHO, 2008).[2]

The use of mortality statistics as an indicator of violence levels is partly a function of the relative ease in obtaining, reporting, and comparing deaths. Criminal justice and public health authorities across countries and cultures tend to treat homicides using broadly similar definitions and concepts. Public health reporting requirements may raise the pressure to collect and report comprehensive data on causes of death, helping to ensure that all or most deaths that occur are captured. Over and above legal obligations, fatal outcomes tend to be viewed as extremely serious across all cultures, thus entailing an ethical obligation to report.

In contrast, various definitions and counting rules are used to capture non-lethal firearm incidents, depending on the nature and characteristics of the injuries as well as the needs and purposes of the data-collecting entity. Depending on the severity of the injury, there may be fewer legal obligations to report non-fatal injuries, even intentional ones. Data is typically obtained through local, city, or state injury surveillance or monitoring systems that are capable of recording the context and mechanism of injuries, such as emergency department admissions. Ideally, the data is coded according to WHO's uniform International Classification of Diseases (ICD) system, now in its tenth revision

Figure 3.1 **Number of armed violence monitoring systems collecting data on different indicators (multiple responses), n=20, multiple responses**

NUMBER OF MONITORING SYSTEMS

Source: adapted from Gilgen and Tracey (2011, p. 30)
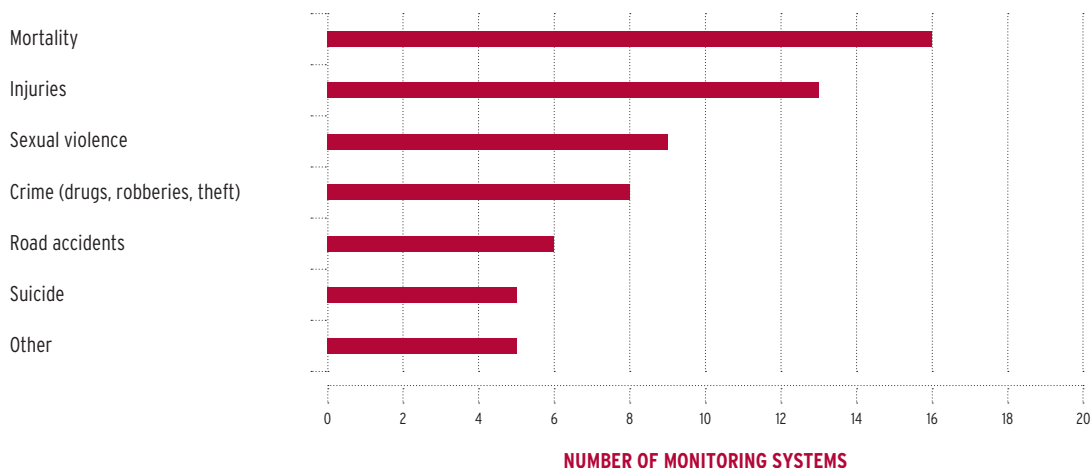
(WHO, n.d.b). In practice, health practitioners in many countries view the time and management requirements necessary to apply the ICD-10 codes as excessively burdensome. Thus, while affiliated hospitals may use a unified data collection system, collection and coding methods are highly variable within and across countries (see Box 3.1).

Police incident reports and victimization surveys provide additional sources of information. They can include details about the nature and circumstances of injuries, including on weapons used, as well as important qualitative information from victims about their experiences. But they are equally marked by a lack of uniformity in methods and reporting.

These factors result in wide gaps in non-lethal violence data, with a notable North–South divide. Given that developing countries are often deeply affected by armed violence, bridging that data gap must become a priority if violence reduction policies are to respond effectively to local conditions. A Geneva Declaration study on 20 armed violence monitoring systems ('observatories') from 13 countries reveals that mortality statistics are the most frequently collected (see Figure 3.1). Data collection on non-fatal injuries is less common.

Quantifying severity

The ICD-10 system allows for public health data to identify whether injuries were caused by interpersonal violence (assault), whether a firearm was used, and whether injuries are *serious* or *slight*. Under this classification, a serious injury leads a patient to be admitted to hospital; a slight injury is one for which a patient can be treated in the emergency

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Box 3.1 Questions of terminology

Armed violence is defined here as 'the intentional use of illegitimate force (actual or threatened) with arms or explosives, against a person, group, community, or state, that undermines people-centred security and/or sustainable development' (Geneva Declaration Secretariat, 2008, p. 2).

Interpersonal violence, which is committed by one or more persons against another or others, is distinguished from *self-directed violence,* or *self-harm* (suicides and suicide attempts). It includes subcategories that clarify the relationship between perpetrators and victims and the setting where the violence occurs, as follows:

- *family* or *domestic violence* includes abuse or maltreatment of relatives—including children and elderly family members—usually (though not exclusively) in the home;
- *intimate partner violence* involves perpetrators who are current or former intimate partners of the victim; and
- *community violence* includes gang or youth violence, rape or sexual assault by strangers, and violence in institutional settings, between individuals who are not related (Krug et al., 2002, pp. 6-7).

While common usage of the term 'injury' suggests non-fatal outcomes alone, injuries are in fact a leading cause of death in many countries—whether due to motor vehicle collisions, intentional violence, natural disasters, or other causes. *Injury* thus indicates acute bodily trauma; serious injuries may cause death days, months, or even years after they were inflicted—creating complications for data collection and reporting.

A *fatal injury* is one from which the victim dies either immediately or after treatment. ICD-10[3] stipulates that if the patient dies within 30 days of the incident, the case should be classified as fatal (Butchart et al., 2008, pp. 12-13). For the criminal justice system, depending on the country, a case of assault may be reclassified as a homicide if the victim dies up to one year after sustaining injury.[4] Thus, a victim who dies from his wounds more than 30 days but less than one year after being injured will not necessarily be recorded as a fatality in public health statistics while being counted as a homicide in criminal justice statistics.

The terms *victim* and *survivor,* often used to refer to those who have suffered a violent injury, reflect the attitudes and priorities of those who use them. 'Victim', mostly used in the criminal justice system, is a label that may carry a stigma of helplessness; the use of the term 'survivors' highlights injury as a form of oppression or lived experience as opposed to a medical condition. 'Disability', the term and concept, describes a person's interaction with society rather than his or her attributes (WHO and World Bank, 2011, p. 4; WHO, n.d.a, p. 1).

Sources: Krug (2002); Buchanan (2011)

department and then released. It should be noted, however, that many slight injuries—and some serious ones—are never reported to or treated in health facilities.

Weapons and ammunition

The severity of a gunshot injury—and the likelihood of death or permanent impairment—is affected by the technical specifications of the ammunition used, including bullet size, type of tip (such as hollow-tipped, pointed, or round-nose), velocity, and 'flight pattern'. These factors influence bullet trajectory through the body and the subsequent damage to tissue, organs, and bones.

In general, the higher the bullet velocity, the more likely the injury is to be lethal. For example, handguns have slower velocity projectiles than rifles and tend to cause less severe injuries. A study in Nigeria's Gombe State finds that the majority of patients presented wounds caused by low-velocity gunshots fired from locally assembled firearms (Ojo, 2008). Another study in Kano, Nigeria, also indicates that the firearms used in assaults in the country are mainly low-velocity handguns (Mohamed et al., 2005, p. 298). The latter study notes that the higher fatality rate observed in the United States in comparison to Nigeria may reflect the use of high-calibre, high-velocity pistols in the United States.

> **The higher the bullet velocity, the more likely the injury is to be lethal.**

In addition to bullet speed, the rate of fire is an important factor affecting the severity of injuries. Semi-automatic and automatic pistols, whose rate of fire exceeds those of single-shot rifles and repeating revolvers, are likely to cause greater injury. Indeed:

> *The increased use of semi-automatic weapons [in the United States] has resulted in changed wounding patterns with an increased number of bullet wounds per incident per body and a subsequent higher mortality* (FICAP, 2009, p. 8).

Bullets lacerate and crush tissue and bones in the direct path of the projectile, also causing what is known as 'cavitation'. When a bullet enters the body, a temporary vacuum is opened for a few thousandths of a second behind it. The pressure applied by the temporary cavity on surrounding tissues and organs provokes injuries far from the bullet path; these can be hard to detect, particularly in soft organs. This pressure is also capable of fracturing bones several centimetres from the bullet track (Prokosch, 1995, pp. 18–19; Waters and Sie, 2003, p. 121). The greater the speed of the bullet, the larger the initial cavity; a large cavity may be 30 to 40 times the diameter of the bullet. After the bullet has gone through tissue, the temporary cavity disappears, leaving a lasting cavity or wound track.

Depending on the type of ammunition and other factors, the projectile may 'tumble' into the body (known as 'yaw'), further increasing the wound cavity. If the bullet fragments, each piece will follow a distinct path, thereby multiplying the damage (Prokosch, 1995, pp. 191–92).

Access to medical care

The physical location of the injury largely determines the types of consequences. Injuries to the extremities often result in fractures that may lead to haemorrhages, infections, amputation, or permanent trauma due to joint or bone deformation. Brain and spinal cord injuries can cause irreversible damage such as paralysis, sexual dysfunction, limited movement, seizure disorders, incontinence, and severe facial disfigurations. Abdominal gunshot wounds may require specialized surgical skills to preserve vital organs. Gunshot wounds to the head have the highest risk of being lethal; similarly, suicide attempts with firearms—in which the gun is most frequently aimed at the head—are most likely to result in death (Vyrostek, Annest, and Ryan, 2004, fig. 21).

A major factor influencing whether an injury is fatal is the accessibility of emergency and trauma care services. Prompt access to qualified medical services may determine not only the victim's chance of survival, but also the

A 14-year-old boy with a gunshot wound to his leg is treated by medical personnel in the emergency room of a hospital near the Petare slum in Caracas, Venezuela, November 2009. © Carlos Garcia Rawlins/Reuters

long-term prognosis and the likelihood of disability. The speed of initial service may also make a difference, as the treatment received in the first hours after the injury may determine whether the patient will die or survive, and, in the latter case, the subsequent quality of life. This factor is particularly significant in rural and low-income areas where only a minority of patients reach the hospital by ambulance. A study conducted in Nairobi, for instance, finds that only 7.7 per cent of firearm injury survivors were brought to hospital by ambulance and only a quarter arrived within one hour of the incident (Hugenberg et al., 2007, p. 416).

Sometimes the knowledge and training of emergency service providers is more decisive than the availability of sophisticated equipment or technology (Hofman et al., 2005, p. 14).

Acute care for gunshot victims may also depend on the existence and enforcement of legislation requiring that medical personnel *immediately* report all victims of firearm incidents to the police. This type of regulation is sometimes aimed at ensuring that injured criminals do not escape through the medical system. In some circumstances, a lack of coordination and fear may create tension between physicians and law enforcement officials. This problem has been noted in Nigeria.[5] The strict application of these kinds of laws is likely to generate delays in the provision of medical care to victims of gun violence and increased mortality rates, especially where police and treatment centres are far from each other (CLEEN, 2010, p. 6).

ASSESSING THE SCALE AND SCOPE OF NON-LETHAL FIREARM VIOLENCE
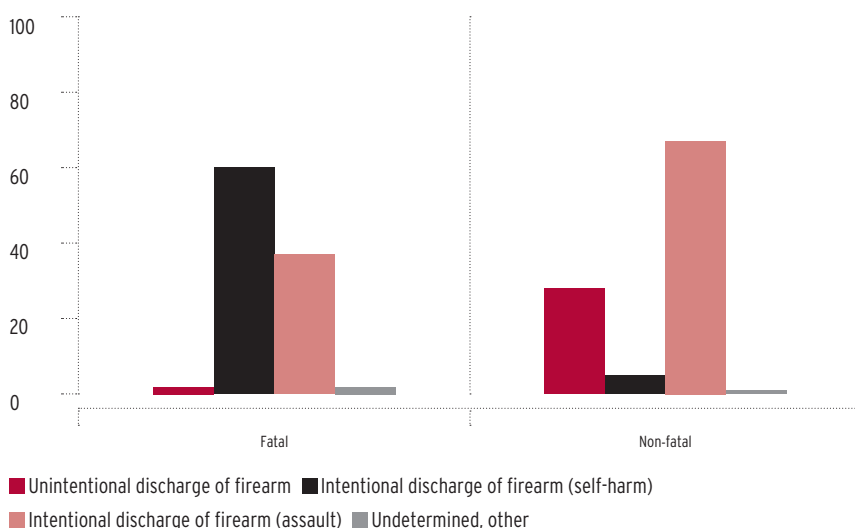
Intentional firearm violence

In the context of efforts to assess and reduce the incidence of armed violence, this chapter focuses on intentional injuries committed with a firearm (firearm assaults), as compared to self-inflicted and unintentional injuries or wounds caused by law enforcement officers in the course of their work (that is, 'legal intervention').[6] This section examines the characteristics and extent of non-lethal firearm violence as it can be estimated from a variety of sources, such as public health, law enforcement, and victimization surveys.

What proportion of firearm violence is due to intentional assaults? It varies significantly by context. In low-income countries a large proportion of firearm-related deaths occur as a consequence of interpersonal violence, mostly in urban settings. In upper middle- and high-income countries, suicides represent the largest proportion of firearm-related deaths (WHO, 2001, p. 3). The case of the United States is illustrative. Figure 3.2 shows the distribution of firearm injuries by outcome (fatal and non-fatal) and intent, also highlighting self-directed harm (suicide and attempted suicide). Suicide represents the majority (60 per cent) of firearm deaths, whereas intentional assaults account for 37 per cent. The majority (67 per cent) of non-fatal firearm-related injuries are caused by intentional interpersonal violence. Unintentional injuries make up more than one-quarter of non-fatal events, while attempted suicides account for only five per cent. The distinction between intentional and unintentional may sometimes be blurred, as in the case of injuries caused by stray bullets (see Box 3.2).

Figure 3.2 **Distribution of fatal and non-fatal firearm injuries in the United States, by intent, 2009[7]**

PERCENTAGE OF INJURIES

■ Unintentional discharge of firearm   ■ Intentional discharge of firearm (self-harm)
■ Intentional discharge of firearm (assault)   ■ Undetermined, other

Note: Totals are not equal to 100 due to rounding.

Sources: CDC (n.d.a); Kochanek et al. (2011)

US Representative Gabrielle Giffords and her husband light a candle during a one-year memorial vigil for the victims and survivors of the shooting incident in which she was critically injured, Tucson, Arizona, January 2012. © Matt York/AP Photo
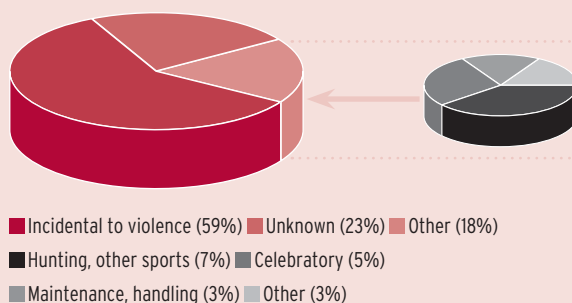
Box 3.2   Stray bullets and celebratory shootings

A clear-cut distinction between 'intentional' or 'unintentional' may be difficult to apply to injuries caused by stray bullets, though they are almost always categorized as unintentional injuries in both health and crime statistics. An analysis of the circumstances of 284 cases of injuries caused by stray bullets in the United States finds that the majority of events (59 per cent) were related to violence (see Figure 3.3); accidents related to firearm maintenance, shooting sports, and celebratory gunfire accounted for 18 per cent of cases combined (Wintemute et al., 2011). The study could not identify the circumstances of 23 per cent of stray bullet-related injuries.[8]

Stray bullets are relatively common in violence-affected contexts and represent a serious concern in many Latin American countries. A survey of media reports and National Police data in Colombia reveals that stray bullets injured at least 1,200 men and almost 700 women between 2001 and 2011, mostly in urban areas (CERAC, 2011). In the municipality of Rio de Janeiro, Brazil, stray bullets were responsible for 9.4 per cent of non-fatal firearm injuries in the first six months of 2011 (Teixeira, Provenza, and Oliveira, 2011, p. 9).

In many countries, people express excitement by firing a gun in the air at weddings, parties, and around New Year celebrations, but also at funerals to show respect for the dead. Such celebratory shootings, while not meant to be violent, do result in casualties. In 2008–09, they represented 5 per cent of all stray bullet injuries in the United States (see Figure 3.3). During New Year celebrations at the end of 2010 in the Philippines, stray bullets injured 30 people, three of them fatally (Suerte Felipe, 2011; BBC, 2011). That same year in Italy, eight people were injured and one killed by stray bullets (*Corriere della Sera,* 2011).

An extensive body of research is devoted to injuries caused by traditional or celebratory shootings in different contexts and cultures, including the specific types of injury they incur (commonly low-velocity head injuries).[9] In particular, these studies focus on injuries among women and children, who represent a sizeable portion of victims of this type of incident. A study conducted in a South African hospital finds that the majority (42 per cent) of children who were treated for firearm injuries over the past decade had been hit by stray bullets (see Box 3.3).

Figure 3.3   **Circumstances of injuries caused by stray bullets in the United States, March 2008–February 2009**

■ Incidental to violence (59%) ■ Unknown (23%) ■ Other (18%)
■ Hunting, other sports (7%) ■ Celebratory (5%)
■ Maintenance, handling (3%) ■ Other (3%)

Source: Wintemute et al. (2011, p. 492)

In the United States, the use of firearms to commit suicide is thus a key factor affecting the proportions and consequences of firearm injuries. When firearms are used to attempt suicide, death occurs in approximately 85 per cent of the cases, a higher rate than suicides attempted using other methods; the death rate is also higher than for intentional assaults with firearms (Vyrostek, Annest, and Ryan, 2004, figs. 20, 21). In developing countries, in contrast, intentional assaults are likely to represent the majority of both fatal and non-fatal firearm-related injuries.
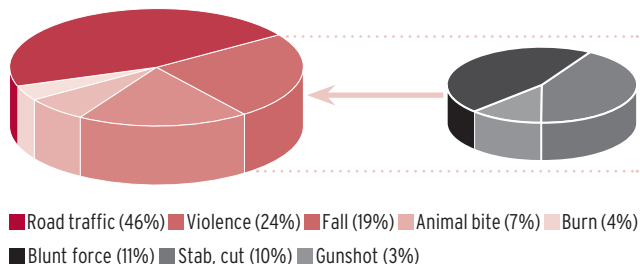
Data sources and trends

Public health data

Injury data typically originates in medical services, which are well placed for capturing the number of patients treated for firearm-related injuries. Although any hospital could collect detailed information on patients being treated for injuries, the identification of different causes, including firearms used, and regular mechanisms for sharing, compiling, and analysing cases at the aggregate level are rare.

The relative burden of firearm-related injuries compared to other types of injuries—such as those sustained in road accidents, falls, and fires—may depend on a range of factors, including the overall levels of violence in the area, firearm availability, and law enforcement presence. Figure 3.4 shows the distribution of injury diagnoses in five hospitals across Uganda in 2004–05 (GBI, 2010). Almost a quarter of all cases were classified as violence-related, with 3 per cent attributed to gunshots and 21 per cent to blunt force or bladed instruments.

Public health sources provide the bulk of statistical data that can be used to assess the extent and trends of non-lethal firearm injuries. For this reason, the analysis presented below relies primarily on public health data.

Figure 3.4 **Distribution of injury diagnoses in five Ugandan hospitals, 2004-05[10]**

■ Road traffic (46%) ■ Violence (24%) ■ Fall (19%) ■ Animal bite (7%) ■ Burn (4%)
■ Blunt force (11%) ■ Stab, cut (10%) ■ Gunshot (3%)

Source: GBI (2010)

A man is rushed to hospital with two bullet wounds following an incident in Nido de las Aguilas, Tijuana, Mexico, March 2008.
© Washington Post/Getty Images

Victimization survey data

Victimization surveys represent another source of information on non-lethal firearm violence. They typically ask respondents about their personal experiences as victims, or sometimes as witnesses, of violence. Most capture information on crimes committed with firearms. Data may cover incidents in which guns were used to threaten or coerce a victim, types of firearms involved, and physical and psychological consequences for victims and witnesses of violence.

Because incidents of firearm violence are statistically rare, the margin of error in victimization surveys is very large, and they rarely connect different types of weapons with types of outcomes. For example, a recent survey carried out in Liberia shows that in 38 per cent of all reported cases of violence, the victim was injured by an instrument (the type is not identified), while in 4.4 per cent of all cases the incident resulted in the death of the victim (Gilgen and Murray, 2011, p. 8). Victimization studies suggest that, on average, approximately a third of victims of all crimes suffer (non-fatal) physical injuries.[11]

The International Crime Victims Survey (ICVS) includes data on incidents involving firearms in 38 countries and cities. Figure 3.5 shows the percentage of survey respondents who were held at gunpoint during robberies and assaults in the eight cities that rank highest in these categories, over the five years preceding the survey. In three of the cities—Johannesburg, Rio de Janeiro, and São Paulo—nearly one in every ten respondents was the victim of a robbery in which the offender had a firearm.

Figure 3.5   **Prevalence of respondents who were victims of armed robberies and assaults with firearms, for the five years preceding the survey**

■ Robbery   ■ Assault

PERCENTAGE OF RESPONDENTS HELD AT GUNPOINT
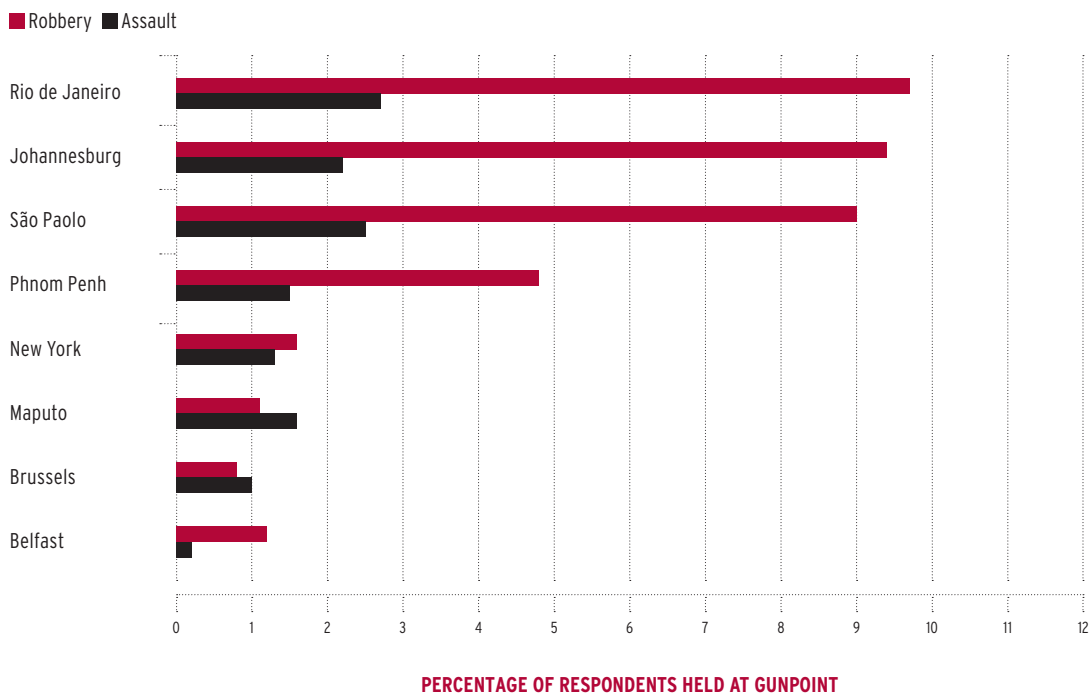
Note: The eight cities in this graph ranked highest for robbery and assault among the 38 countries and cities included in the ICVS 2004-05.

Source: van Dijk, van Kesteren, and Smit (2007)

Surveys provide insight into the significant variation in the use of firearms in non-fatal crimes across countries and cities. The 2008 national victimization survey in Mexico finds that more than half of the victims of all crimes were confronted with firearms (Juárez, 2010, p. 16, fig. 7). In Kenya, a survey conducted in 2011 among 2,400 households reveals that slightly more than a third of those who were victims of crime or violent encounters faced a firearm, with 15 per cent of victims noting that the assailants had a handgun, and 17 per cent reporting an automatic weapon, such as an AK-47 (see Figure 3.6). The high percentage of incidents involving automatic weapons is alarming as it indicates their widespread distribution over the territory and their involvement in crime (Small Arms Survey and KNFP, 2012).

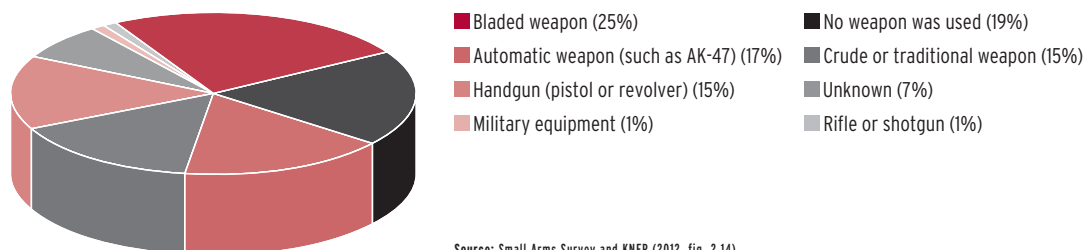Figure 3.6   **Weapons identified by victims of crime or violence in Kenya, 2011[12]**

■ Bladed weapon (25%)   ■ No weapon was used (19%)
■ Automatic weapon (such as AK-47) (17%)   ■ Crude or traditional weapon (15%)
■ Handgun (pistol or revolver) (15%)   ■ Unknown (7%)
■ Military equipment (1%)   ■ Rifle or shotgun (1%)

Source: Small Arms Survey and KNFP (2012, fig. 2.14)

Figure 3.7 **Percentage of violent victimizations involving firearms in the United States, 2001–10**

PERCENTAGE   ■ Total violent victimizations ■ Serious violent victimizations
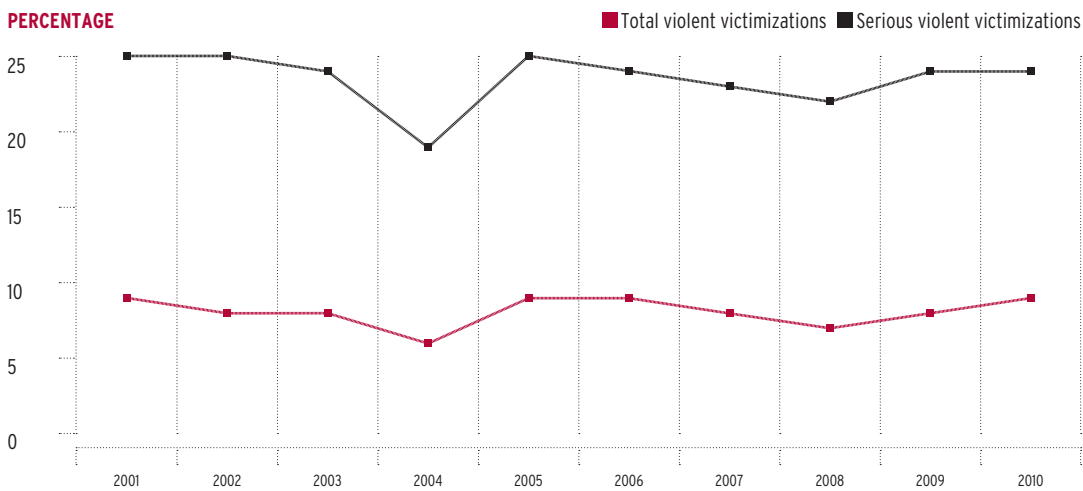

Source: Truman (2010, p. 8, figure 7)

Irrespective of the different levels of violence in the 38 countries and cities surveyed, the ICVS finds that the proportion of incidents involving firearms was higher in urban areas and was, on average, 12 per cent for robberies and 5 per cent for assaults (van Dijk, van Kesteren, and Smit, 2007, pp. 76, 80). In the United States the proportion of non-fatal firearm-related crime remained relatively stable in the period 2001–10, accounting for between 6 and 9 per cent of total violent crime and 20–25 per cent of serious crime[13] (see Figure 3.7). In 2010 firearms were involved in approximately a quarter of cases of rape, robbery, and aggravated assault; firearms were most likely to be used in the robberies (29 per cent of cases) (Truman, 2010, p. 8 and table 4).

Despite its limitations, victimization survey data is useful for assessing the overall extent of firearm violence and for supplementing public health data. This is particularly true for understanding non-physical consequences, such as serious psychological stress to victims, family members, and friends. These effects can be felt even when a firearm is only used to threaten.

Putting the data together: lethal v. non-lethal violence

What are the consequences of firearm violence? The proportion of firearm incidents that result in death varies across different contexts. The Small Arms Survey has examined data on non-lethal firearm injuries, selecting data representing intentional violence or assault from approximately 28 countries and territories, a relatively small sample in comparison to homicide databases.[14] A range of factors influences the poor availability of comparable non-fatal injury statistics. Much of the data is collected locally (for example by a few hospitals or a group of cities or provinces) using widely diverging methodologies and information collection systems. For this reason, among others, data is seldom nationally representative or comparable across countries.

One way of analysing data on lethal and non-lethal firearm violence is to estimate national 'case fatality rates'[15]— the number of cases with a lethal outcome divided by the total number of lethal and non-lethal cases. This concept is used in epidemiology to provide a rough indicator of the proportion of persons who do not survive a specific type of disease or injury over a specific period of time, with the objective of reducing the proportion through improved medical services, prevention programmes, and other interventions.
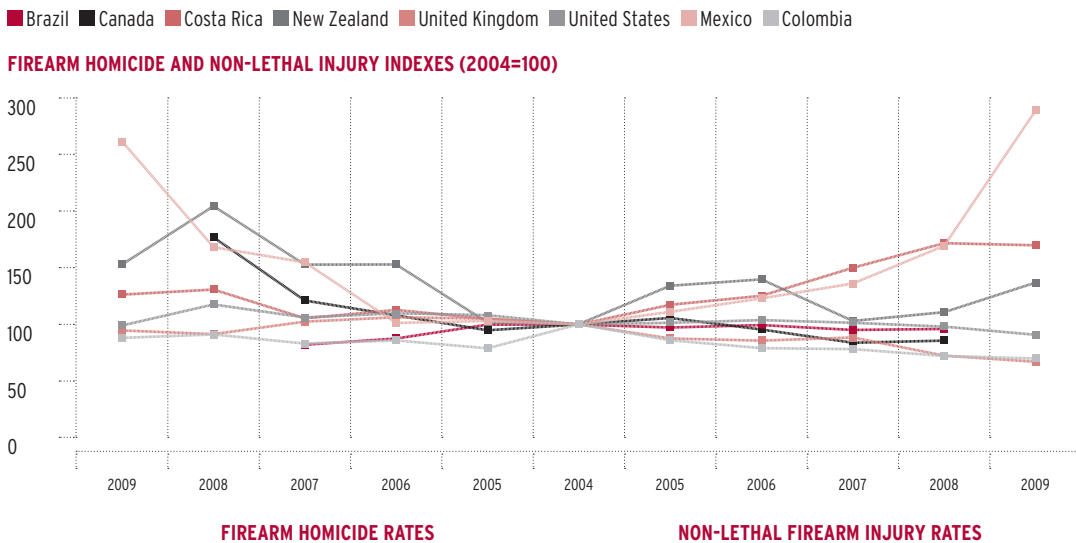
Figure 3.8 **Non-fatal firearm injuries and firearm homicides in 26 countries, latest available year**

FIREARM HOMICIDE RATE

NON-LETHAL FIREARM INJURY RATE
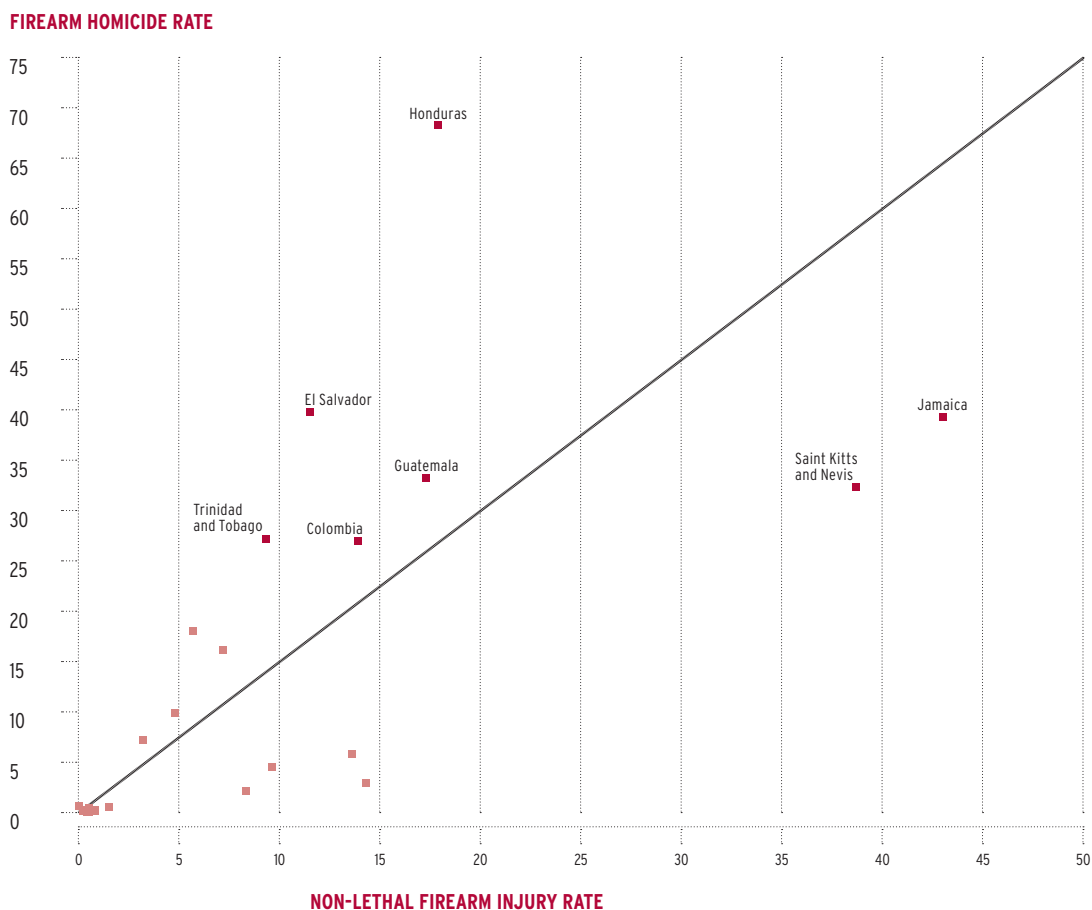
Source: Small Arms Survey (2011); UNODC (2011b)

Figure 3.8 compiles injury data from the 2011 Small Arms Survey non-lethal firearm injury database and firearm homicide data from UNODC (2011b). The estimates must be regarded as tentative, as data on fatal and non-fatal injuries originate from different sources and data collection systems, may not be representative of the same populations, and reflect different time periods. Yet the data suggests that the higher a country's firearm homicide rate, the higher its case fatality rate for all firearm violence. In the 26 countries for which relevant data is available,[16] there is a correlation between the rate of firearm homicides and non-lethal firearm injuries (0.689, N=26).

A more rigorous comparison of case fatality rates would require compatible data series and counting methods, which exist for only a handful of countries.[17] Data from the United States and the UK (England and Wales), for example, yields a case fatality rate of close to 20 per cent, or approximately four non-fatal cases for every death.[18] But there is significant variation in the case fatality rate across countries and in the same country at different points in time. A study carried out in Kano, Nigeria, documents eight non-fatal firearm injuries treated for every firearm death, for a case fatality rate of 11 per cent, much lower than that observed in the United States and the UK (Mohammed et al., 2005, p. 298).

Figure 3.9 **Trends in non-fatal firearm injuries and firearm homicides in seven selected countries, 2004–09 (index year 2004=100)**

■Brazil ■Canada ■Costa Rica ■New Zealand ■United Kingdom ■United States ■Mexico ■Colombia

FIREARM HOMICIDE AND NON-LETHAL INJURY INDEXES (2004=100)

FIREARM HOMICIDE RATES   NON-LETHAL FIREARM INJURY RATES

Source: Small Arms Survey (2011); UNODC (2011b)

Among the countries and territories shown in Figure 3.8, few have comprehensive longitudinal series that can be used for trend analysis. Based on available data from the United States, a study demonstrates that the lethality of serious assaults in the country dropped dramatically between 1960 and 1999 (Harris et al., 2002). Figure 3.9 shows an example of changes in national rates of lethal and non-lethal injuries for 2004–09 in seven countries for which relevant data is available. It highlights trends in firearm homicide rates on the left side and non-lethal firearm injuries on the right. In three of seven countries—namely Costa Rica, Mexico, and New Zealand—both lethal and non-lethal injuries increased over the observed period (LATIN AMERICA AND THE CARIBBEAN; DRUG VIOLENCE).

Based on the data presented in this section, it is possible to generate an average global case fatality rate of 48 per cent for intentional, non-conflict firearm injuries, or approximately one non-fatal injury for every fatal injury. In the worst-case scenario, if every gunshot were fatal (a 100 per cent case fatality rate), there would be no survivors. Countries such as Brazil, Colombia, and Mexico, which all show higher rates of firearm homicide, show a case fatality rate of around 70 per cent (LATIN AMERICA AND THE CARIBBEAN; DRUG VIOLENCE). If the correlation were to hold globally, gunshot victims in countries with higher overall levels of firearm violence could be considered less likely to survive their injuries; by contrast, the lower the overall levels of firearm violence, the better the chances that a shooting victim will survive his or her injury.

The 2011 edition of the *Global Burden of Armed Violence* estimates that there are 396,000 intentional non-conflict homicides per year (Geneva Declaration Secretariat, 2011, p. 43). The 2008 edition concludes that approximately 60 per cent of all homicides worldwide are committed with firearms (Geneva Declaration Secretariat, 2008, p. 67); UNODC sets the proportion lower, at approximately 42 per cent globally (UNODC, 2011a, p. 10). Applying these two estimates as low and high limits (42–60 per cent) to the total annual number of homicides generates between 166,000 and 238,000 firearm homicides per year. A calculation based on the average case fatality rate would put the number of non-fatal firearm assaults at the same level or higher. Assuming that trends are stable, and not taking into consideration

the potentially reduced life expectancy for firearm injury survivors, these calculations suggest that an estimated 2 million people worldwide are living with firearm injuries sustained in non-conflict settings over the past decade. This is a conservative estimate; in many countries the number of survivors is increasing, suggesting that the number of persons living with the consequences of firearm injuries is much higher. Assuming a ratio of 3:1 (three non-lethal injuries for every death), as is often cited for the United States, an estimated 500,000 to 750,000 people are injured by firearms every year.

Assessing the cost of firearm injuries

An estimated 500,000 to 750,000 people are injured by firearms every year.

Direct medical costs for firearm injuries, including hospital stays, diagnostic procedures, surgery, and blood products, are substantial and often exceed the costs of treating other injuries and medical emergencies (Norberg et al., 2009, p. 443). But they represent only a portion of the total costs to the victim and society.

Research was carried out in the United States in the 1990s, when the firearm violence epidemic was at its peak, to assess the overall cost of firearm injuries. One study estimates that direct and indirect costs exceeded USD 20 billion in 1990, of which USD 1.4 billion represented direct medical costs (Max and Rice, 1993, p. 171). Another study, focusing exclusively on medical costs, estimates the mean cost per injury at about USD 17,000, which includes hospitalization (as victims who survive firearm injuries frequently require multiple rehospitalizations) and subsequent medical treatment spread over a victim's lifetime. Based on the number of firearm injuries in the US in 1994, the study estimated a total cost of USD 2.3 billion. The study finds that approximately three-quarters of these costs were borne for gunshot injuries due to violence (Cook et al., 1999, p. 453).

The local impact of the costs related to armed violence depends on the rate of firearm injuries and average income levels. A study carried out in Jamaica reveals that firearm-related injuries accounted for approximately 16 per cent of all injuries in 2006 but roughly 75 per cent of total direct medical costs for fatal injuries, 53 per cent of direct medical costs for serious injuries, and 6 per cent of direct medical costs for slight injuries (Ward et al., 2009, p. 448). A 2005 study observes that the average cost of treating one serious firearm injury was 13 times greater than the South African government's annual per capita expenditure on health (Allard and Burch, 2005, p. 591). In Kenya, a study based on a six-month surveillance of medical treatment of gunshot injuries in Nairobi finds that the average hospital bill was approximately USD 225—more than six times the monthly income of someone living below the poverty line (Hugenberg et al., 2007, p. 415).

According to a WHO typology, a comprehensive assessment of direct costs of firearm violence would include expenses linked to policing and imprisonment, legal services, foster care, and private security (Butchart et al., 2008, p. 7, table 1). Tangible indirect costs include loss of productivity, lost investments in social capital, and higher insurance costs; a broad range of intangible indirect costs may also be taken into account, such as reductions in or limitations on health-related quality of life (pain and suffering, both physical and psychological), job opportunities, access to schools and public services, and participation in community life.

CHALLENGES TO NON-FATAL INJURY SURVEILLANCE

As noted above, systematic monitoring of non-lethal firearm violence presents a series of challenges. Obstacles may be particularly difficult to overcome in areas where violence is pervasive, and where surveillance is thus most needed. But while a North–South divide with respect to non-lethal violence surveillance exists, the systems in place

in many industrialized countries are often incomplete as well. This section describes some efforts in developed and developing countries to monitor non-fatal firearm injuries—and the main roadblocks they face.
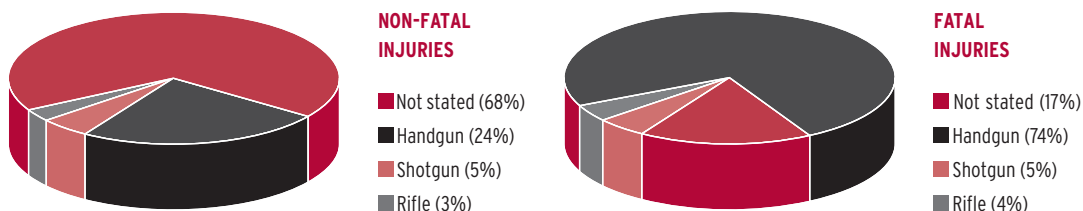
Sample surveillance systems

The 'gold standard' of non-lethal firearm violence surveillance involves the systematic generation of detailed health records in emergency departments and hospital admissions. This type of system is extremely rare, however.

In practice, health-based surveillance systems are almost never comprehensive or complete. The United States is one of the few countries with a relatively sophisticated, nationwide non-fatal injury surveillance system that captures firearm violence. The National Electronic Injury Surveillance System (NEISS) is operated by the US Consumer Product Safety Commission, which collects data on injuries treated in a nationally representative sample of 66 hospital emergency departments.[19] The Commission itself does not release data on firearm-related injuries, but the National Center for Injury Prevention and Control of the US Centers for Disease Control and Prevention (CDC) accesses, analyses, and publishes firearm data. The data is used to monitor progress towards the government's goal of achieving a 10 per cent reduction in the national rates of non-fatal firearm injuries from their 2007 levels by 2020—a reduction from 20.7 to 18.6 per 100,000.[20]

The US system captures a range of information for non-fatal firearm injuries treated in emergency rooms, including age, sex, race or ethnicity of the victim; intent of injury (unintentional, self-harm, assault, legal intervention, undetermined intent); primary body region affected; and place of occurrence (such as home, public place, street, school).[21] Data is coded according to WHO's ICD-10 categories.

But even this relatively advanced system has limitations. For example, estimates for non-fatal firearm injuries treated in hospital emergency departments can be only provided at the national level, not at the state and local levels. It does not capture outpatient or clinic (non-hospital) visits. Full coding remains a challenge; even though the system is designed to capture information on the race or ethnicity of the injured person, the type of firearm used (such as a handgun, rifle, or shotgun), and the victim–suspect relationship, this information is rarely coded. Figure 3.10 compares information from the Inter-University Consortium for Political and Social Research and the Federal Bureau of Investigation regarding the type of firearms used in cases of fatal and non-fatal injuries. The type of firearm used was not coded in 68 per cent of all cases of non-fatal injuries,[22] as opposed to only 17 per cent of fatal cases (FBI, 2010). Approximately three-quarters of lethal firearm injuries are caused by handguns, whereas the distribution by type of firearm causing non-fatal injuries is largely unknown (though handguns probably also represent the majority in non-fatal cases).

Figure 3.10 **Non-fatal firearm injuries treated in hospital emergency departments and homicide victims in the United States, by type of firearm, January 2006–December 2008**

NON-FATAL INJURIES
- Not stated (68%)
- Handgun (24%)
- Shotgun (5%)
- Rifle (3%)

FATAL INJURIES
- Not stated (17%)
- Handgun (74%)
- Shotgun (5%)
- Rifle (4%)

Source: ICPSR (2010, p. 28); FBI (2010)

A small number of other, mainly Northern countries have promising systems in place that capture non-fatal firearm injuries. For example, the Netherlands monitors the numbers and rates of hospital admissions for non-fatal firearm assaults[23] for in-patients in hospitals and clinics across the country. The Centraal Bureau voor de Statistiek produces publicly available annual reports on both rates of non-fatal firearm assaults per 10,000 population for men and women and the average number of days of treatment per injury. The type of weapon and the victim–offender relationship is not captured, however (CBS, n.d.).

Key challenges

Most other countries have far weaker systems, if they have them at all. According to an initial survey conducted by the Small Arms Survey, some form of injury data is collected in approximately 60 countries, but the vast majority provide little or no data on non-fatal violence, are unable to disaggregate data according to weapon type, and do not specify intentionality (Pavesi, 2011, pp. 6–8). Among the most significant obstacles to better surveillance are a lack of comprehensiveness and standardization, non-representative sampling, and data entry and computerization problems, as discussed below.

Comprehensive and standardized injury surveillance. Ideally, hospital-based injury data collection systems would document firearm-related injuries within the framework of all-injury data collection systems. The primary advantage of a comprehensive system is the potential for widespread standardization in coding injuries, the instruments that cause them, and intentionality; such standardization would provide common definitions and details on injury context. Yet to date, only a fraction of countries have made progress towards comprehensive injury surveillance.

WHO's ICD-10 system provides a universally applicable scheme for coding non-fatal firearm violence, but its application is far from universal. Simple forms and questionnaires for the purpose of injury surveillance have been designed on the basis of WHO guidelines. For example, a model form developed in 2007 by the Central America injury project of the Pan American Health Organization and the CDC has been slightly modified to fit local needs in Colombia, El Salvador, and Nicaragua (Zavala et al., 2007, p. 435).

Mortality vs. injury surveillance. The non-fatal component is missing in many surveillance systems, which typically capture information on instruments used for fatal injuries only. For example, the National Injury Mortality Surveillance System (NIMSS) in South Africa represents the only means to estimate the extent of firearm violence in the country (see Box 3.3).

Representative sampling. Since no system can capture every injury at every hospital, non-fatal injury surveillance relies on a statistical sampling of cases to generate representative data (whether at the city, state, provincial, or national level). For example, the design used by the NEISS system is a stratified probability sample of all US hospitals that have at least six beds and provide 24-hour emergency services. These hospitals are divided into four strata based on their size, plus one children's hospital stratum (Hootman et al., 2000, pp. 268–69; CDC, n.d.b). With statistical analysis, the sample data can thus be extrapolated to the national level. Yet in countries with fewer hospitals, where injuries cluster significantly in one geographical area, or where injuries are not seen in hospital emergency departments—as is the case in many rural, underdeveloped areas—generating a representative sample can be challenging. Furthermore, violence levels are not among the elements taken into account for sampling, thus areas with either very high or very low levels of violence may be included in the sample and generate a bias in the analysis.

Box 3.3 **Measuring fatal and non-fatal firearm violence in South Africa**

In the years leading up to and immediately following the fall of the Apartheid regime in 1994, levels of gun violence in South Africa increased dramatically, leading to a national debate about guns and armed violence in the country. While many civil society and some political stakeholders called for the passage of new, comprehensive national civilian gun regulations, there was a clear need for better data on gun homicides and non-fatal gun injuries.

During this period, the public health community initiated fatal injury surveillance projects to help ascertain the distribution of violence and injury deaths and to identify injury control priorities. This approach was first demonstrated in Cape Town in the mid-1990s (Lerer, Matzopoulos, and Phillips, 2007); since 1998, the mortuary-based National Injury Mortality Surveillance System has collated data from mortuaries across South Africa. The NIMSS serves three interest groups: the forensic medical services, the crime prevention and justice community, and violence and injury prevention agencies (NIMSS, 2004, pp. 2–3).

This data was particularly instructive for tracking year-to-year homicide rates from 2000 onwards, as well as the decline in gun deaths following the implementation of the national Firearms Control Act No. 60, which was passed in 2000 and came into full effect in 2004 (South Africa, 2000).[24] Longitudinal analysis has demonstrated the importance of sustained and consistent injury mortality reporting to understand trends in violent injuries.

In 2003 the NIMSS annual report included city-specific chapters, and the following year mortality rates were calculated for the period 2001 to 2004 for four cities—Cape Town, Durban, Johannesburg, and Pretoria—alerting researchers to a substantial decrease in firearm homicides relative to non-firearm homicides (NIMSS, 2004; 2005). Subsequent reports suggest that this reduction was sustained through 2007 (NIMSS, 2007; 2008).

Data from two mortuaries serving Cape Town shows that changes in the number of homicides processed at these two mortuaries were attributable to fluctuations in the number of firearm homicides, while levels of non-firearm homicides remained stable. The Cape Town data revealed that there had been a consistent year-to-year increase in firearm homicide beginning in 1994, when firearms were involved in just 28 per cent of all homicides processed at the two mortuaries, to 49 per cent in 2002, after which there was a substantial decline. According to police statistics, rates of common assaults and assaults with the intent to inflict grievous bodily harm also began steep declines in 2003 (SAPS, 2011, p. 3).

There is no comprehensive surveillance system for non-fatal firearm injuries in South Africa. Monitoring does occur in specific settings, however. One such example is the Red Cross War Memorial Children's Hospital (RXH) in Cape Town, the country's only dedicated paediatric trauma unit for children under the age of 13. The hospital provides secondary and tertiary services for all hospitals in the Western Cape region, which has a population of 4.5 million.

The Childsafe South Africa programme, established in 1987, has maintained a database of all patients treated at the RXH trauma unit since 1991 (Childsafe South Africa, n.d.). The data includes demographic markers, details of the cause of injury, age at injury, an injury severity score, and details of the outcome. The database has produced two reports on paediatric firearm injuries treated in the hospital (for the years 1991–2000 and 2001–10), covering 441 cases in total (including lethal and non-lethal cases). Figure 3.11 shows the number of non-lethal firearm injuries in children admitted to the hospital between 1991 and 2010.

The studies find that from 2000 to 2010 (169 patients), most children (80 per cent) were hit by a single bullet. The majority (42 per cent) were hit by stray bullets; 14 per cent were hit intentionally by an adult; 3 per cent were hit intentionally by another child; 2 per cent of children were shot while they were playing with a gun. In 14 per cent of the cases the gunshot was accidental. Four children presented with fatal injuries. During the same period, 33 children (under the age of 12) died immediately after being shot and were sent directly to a mortuary.

In analysing the longitudinal data provided by Childsafe, Hutt et al. (2004) find that there was a significant decline in injuries over the period during which the Firearms Control Act was introduced, passed, and implemented (2000–04). While levels have increased slightly since then, they remain significantly lower than they were before the act was introduced.

These findings suggest that the introduction of gun control legislation has led to a reduction in firearm injuries, including those caused by accident and stray bullets.

Source: Kirsten and Matzopoulos (2011); Campbell et al. (2011)

Figure 3.11   **Annual number of non-lethal gunshot wounds in children attending the RXH, 1991–2010**
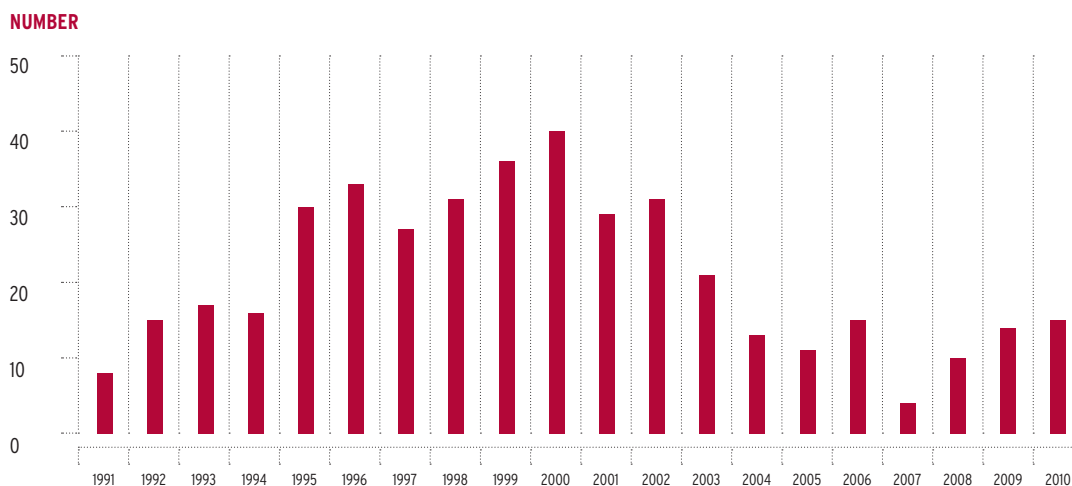
NUMBER

Data entry and computerization. In most developing countries, information is recorded using pen and paper, subject to the training and capacity of dedicated staff, who often operate in very challenging conditions. Figure 3.12 shows a record of admission in Liberia based on a very simple data collection scheme (Winnington, 2011b). In such cases, data is far less likely to conform to international standardized codes and is more difficult to collate and analyse. Still, the regular application of such methods ensures that crucial information can be captured so that it may help provide early assistance to victims.

Making do: one-off surveys

These multiple challenges mean that in most parts of the world, data on non-fatal firearms violence is primarily generated at the local level, if at all, through non-representative surveys, which are often supported by external funding from donor governments or philanthropic organizations that seek to promote an evidence-based approach to armed violence prevention. Once external backing ends, these initiatives are rarely continued.

A case in point is a survey of violence-related injuries in three hospitals in Timor-Leste, which was funded by the Australian Agency for International Development for the period 2006–08 and made possible

Figure 3.12   **Example of a hospital admission record, C.H Rennies Hospital, Kakata, Upper Margibi County, Liberia, 2011**
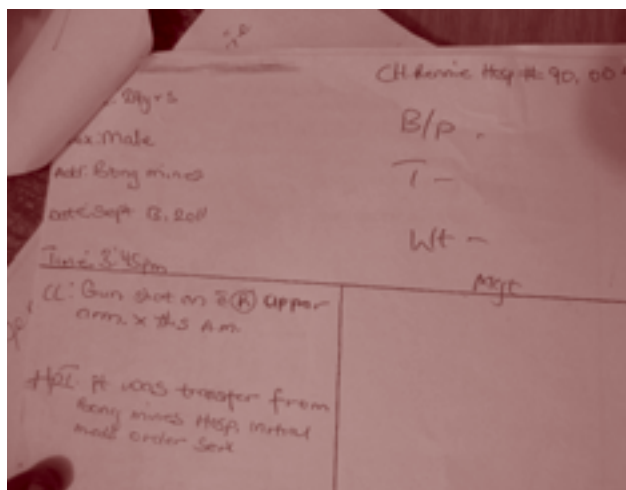
Courtesy of Dr A. Winnington, IPPNW (New Zealand)

Box 3.4 Small arms victimization and disability: Jonglei, South Sudan

Jonglei is the largest state in South Sudan, with a population of approximately 1.36 million. Despite the 2005 peace agreement between the Sudan People's Liberation Army and the Government of Sudan, and South Sudan's secession in 2011, Jonglei remains highly insecure. In addition to experiencing low-level resource-based conflict, the state is at the epicentre of ongoing militia violence (HSBA, 2011).

As modern health facilities are rare, access to health services in Jonglei State is extremely poor. The injured who do reach a hospital or clinic are treated in facilities that are short on equipment, medicines, and skilled medical staff. Those who do not are frequently treated by traditional healers and bonesetters who are often unable to help, and sometimes introduce infections and further complications.

Bor State Hospital, the only referral hospital in Jonglei State, was run by Médecins sans Frontières–Belgium until 2009, when the organization withdrew after a security-related incident. Since then, the level of services in Bor Hospital has deteriorated. At this writing, most hospital staff did not have formal qualifications and some were illiterate and thus incapable of producing patient documentation; hospital equipment was substandard or broken. However, the hospital has an outpatient department as well as surgical, orthopaedic, medical, paediatric, and maternity wards–and a physical rehabilitation unit was recently added with the support of Handicap International.

Data in Tables 3.1 and 3.2[25] shows that firearm-related injuries resulting from the use of small arms and light weapons represented 7.2 per cent of all cases over the period under review (2008–11), while landmine and unexploded ordnance incidents represented 0.4 per cent. Small arms and light weapons incidents increased as a proportion of all injuries in 2009. The typology of disability caused by gunshot incidents is diverse, with 26 per cent of victims left with permanent deformities or chronic loss of joint motion, and 18 per cent with fractures; 17 per cent required amputation.

Source: Dejito and Turton (2011)

A 20-year-old woman recovers from a gunshot wound to her arm, and a spear wound to her back, at a hospital in Akobo, Jonglei state, August 2009.
© Peter Martell/AFP Photo

Table 3.1 Typology of injury, Bor and Twic East Counties, Jonglei, 2008–11						
Cause of injury	**Year**				**Total**	**Percentage of total**
	2008	**2009**	**2010**	**2011 (8 months)**		
Congenital	30	10	29	1	70	1.72
Landmine or unexploded ordnance	5	3	9	1	18	0.44
Small arms and light weapons	79	100	61	52	292	7.20
Burns	15	50	31	15	111	2.74
Other injuries*	640	681	972	253	2,546	62.74
Illness**	184	78	107	79	448	11.04
Unknown	101	37	0	435	573	14.12
Total	**1,054**	**959**	**1,209**	**836**	**4,058**	**100.00**

Notes:
* 'Other injuries' include road accidents, domestic violence, falls, and animal bites.
** 'Illness' includes stroke, diabetes, malaria, typhoid, polio, and other illnesses characterized by sudden weakness or paralysis, high fever, and/or convulsions. There is often no proper diagnosis because of the technical and professional limitations of the health facilities.

Source: Dejito and Turton (2011)

Table 3.2 Consequences of small arms disability, Bor and Twic East Counties, Jonglei, 2008–11						
Disability	**Year**				**Total**	**Percentage of total**
	2008	**2009**	**2010**	**2011 (8 months)**		
Deformity and contracture	29	23	16	8	76	25.76
Paralysis and weakness	8	5	1	0	14	4.75
Amputation	19	15	13	2	49	16.61
Fracture	5	11	23	15	54	18.31
Other physical*	14	0	0	4	18	6.10
Wound**	4	46	10	24	84	28.47
Total	**79**	**100**	**63**	**53**	**295**	**100.00**

Notes:
* 'Other physical' refers to blindness and visual impairment, deafness and auditory impairment, and speech impairment.
** 'Wound' refers to both fresh and infected wounds.

Source: Dejito and Turton (2011)

through a cooperative agreement with the East Timorese Ministry of Health. It generated substantive findings about non-fatal firearm injuries but also highlighted some of the core problems of monitoring non-fatal injuries in developing countries. The report concludes that emergency department data 'is currently not sufficiently robust or sys-

tematically recorded to provide a reliable picture of interpersonal violence in Timor-Leste society' (TLAVA, 2009, p. 1). The same could be said for many other countries across the developing world. Box 3.4 discusses a recent targeted survey conducted in Jonglei, South Sudan, an area highly affected by gun violence but without adequate health facilities to treat injuries, and with little or no injury monitoring capacity.

When hospital and survey data is inaccessible or nonexistent, news reports can provide another option for documenting non-fatal firearm injuries. In 2010, the Small Arms Survey conducted a retroactive review of media-reported incidents of armed violence, both fatal and non-fatal, in Yemen, covering the period from 1 September 2008 to 31 August 2009. The study identifies 199 separate incidents of armed violence involving 728 intentional deaths and 734 non-fatal injuries. Media reports were often detailed enough to capture whether incidents resulted from political or social conflict, whether they were criminally motivated or related to domestic violence, and whether they were intentional (YAVA, 2010, p. 2). Yet numerous caveats apply to the use of media reports to monitor violence.[26] In particular, journalist access to high-risk areas can be severely limited, and local and national interests may exert control over reporting, creating sampling bias. In many cases, news reporting is biased towards urban events, while under-representing rural areas. News stories also often fail to capture crucial details about the circumstances of violent events.

CONCLUSION

What happens after a bullet hits a body? The impact and consequences of armed violence cannot be measured exclusively by counting the number of people killed. Most victims survive, but there are still serious gaps in our knowledge of trends and patterns of firearm injuries that do not result in death, as well as of the long-lasting consequences experienced by gun violence survivors.

The good news is that a tentative research agenda is emerging. The integration of statistics from various sources has already enhanced our picture of firearm violence at the local, national, and regional levels. The Global Burden of Injuries project has begun developing analytical tools to produce better estimates of the extent of violence-related injuries using a variety of sources (GBI, n.d.); its continuation would advance relevant knowledge. Where possible, data should distinguish injuries caused by intentional violence from other types of injury. In particular, the use of WHO injury surveillance protocols should be further expanded.

Yet estimation techniques are a weak substitute for emergency room surveillance systems, which remain rare. Developing, supporting, and sustaining hospital-based surveillance systems may create extra work for beleaguered medical staff, but the value in doing so is undeniable—not only for administrative and planning purposes, but also for improved pre-hospital and emergency care, and for the design, targeting, and monitoring of prevention and control strategies. Injury surveillance systems that capture non-fatal injuries also represent important entry points for donors focused on violence prevention.

Until non-fatal injuries are systematically monitored and the data is made available to researchers and policy-makers, an accurate picture of the full impact of gun violence on societies will remain elusive. Far from being an abstract need, expanding the evidence base is critical to identifying, developing, and evaluating promising prevention measures. As of 2012, however, most incidents of gun violence in non-conflict settings—some hundreds of thousands of cases per year—still go unrecorded.

LIST OF ABBREVIATIONS

CDC	Centers for Disease Control and Prevention
ICD	International Classification of Diseases
ICVS	International Crime Victim Survey
NEISS	National Electronic Injury Surveillance System
NIMSS	National Injury Mortality Surveillance System
RXH	Red Cross War Memorial Children Hospital, Cape Town
UNODC	United Nations Office on Drugs and Crime
WHO	World Health Organization

ENDNOTES

1   According to the Geneva Declaration, nine out of ten violent deaths occur in non-conflict settings (Geneva Declaration Secretariat, 2011, p. 1).

2   It should be noted that many African and Asian countries lack reliable homicide data from either the criminal justice or public health systems.

3   ICD-10 codes X93–X95 capture the incidence of intentional firearm injuries (WHO, n.d.b).

4   Criminal justice systems in different countries may apply different rules. For an example of counting rules for homicides in the UK, see UK Home Office (2011, p. ii).

5   Section 4(2) of the Robbery and Firearms (Special Provisions) Act reads as follows: 'It shall be the duty of any person, hospital or clinic that admits, treats or administers any drug to any person suspected of having bullet wounds to immediately report the matter to the police' (Nigeria, 1984). The law imposes severe penalties for violations, including imprisonment for physicians and the closing down of clinics (Nigeria, 1984, s. 4(4)).

6   ICD-10 code Y35.0 captures any injury sustained as a result of an encounter with a law enforcement official, whether on-duty or off-duty. It includes injuries sustained by law enforcement officials, suspects, and bystanders involving firearm discharge (WHO, n.d.b).

7   This graph reflects data obtained from CDC (n.d.a) for non-fatal injuries caused by firearms in 2009. Based on the category 'all intents' (which yields the total), the chart shows the unintentional, self-harm, and assault categories, while the 'undetermined, other' category represents the difference between the sum of the latter three and the total.

8   The 284 cases were selected from 510 cases that had been published in media reports in the 12 months from March 2008 to February 2009. Of the 284 stray bullet injuries, 20 per cent were fatal (Wintemute et al., 2011).

9   See, for example, Incorvaia (2007) and Özdemir and Ünlü (2009).

10   Categories in Figure 3.4 reflect the International Classification of External Causes of Injuries; for more details, see ICECI Coordination and Maintenance Group (2004).

11   See Truman (2010) and Alvazzi del Frate (1998, pp. 65–66).

12   The number of victims was 398, or 21.1 per cent of a sample of 1,884 respondents.

13   Serious crime includes rape and sexual assault, robbery, and aggravated assault (Truman, 2010, p. 2).

14   The Small Arms Survey database on non-lethal firearm injuries includes primarily health statistics. In the absence of public health information for any country, it contains crime statistics that conform to a variety of classifications and definitions (such as non-fatal firearm injury, non-lethal violence, non-fatal shooting, non-fatal physical assault, assaultive injury, serious injury, and gunshot wound). The GBAV 2011 database on homicide contains data from 199 countries and territories (Geneva Declaration Secretariat, 2011); the UNODC database on homicides committed with firearms covers 116 countries (UNODC, 2011b).

15   The concept of 'case fatality rate' is based on analysis of CDC data (CDC, n.d.a), which uses the following formula: fatal injuries / [fatal + non-fatal injuries] * 100.

16   The countries are: Australia, Belgium, Brazil, Canada, Chile, Colombia, Costa Rica, Denmark, Egypt, El Salvador, Estonia, Guatemala, Honduras, Israel, Jamaica, Latvia, Mexico, Netherlands, New Zealand, Nicaragua, Panama, Saint Kitts and Nevis, Trinidad and Tobago, United Kingdom (England and Wales), United Kingdom (Northern Ireland), and United States of America. Firearm homicide data is not available for two of the 28 countries in the Small Arms Survey non-lethal firearm injury database.

17   For example, some hospital admissions do not make a distinction between *serious* and *slight* injuries. The countries in which these hospitals operate thus record a higher number of injuries than those whose hospitals only capture serious injuries. Consequently, these countries will register an apparent lower proportion of fatalities, resulting in a lower case fatality rate. Furthermore, in some settings, especially in developing countries, it may be difficult to obtain and match data from different sources, such as numbers of victims who died at the scene, patients treated by private hospitals, and police records, which often lack contextual details (Ojo et al., 2008, p. 6).

18   Data covers 2009 in the United States and 2011 in the UK, as calculated based on Small Arms Survey (2011) and UNODC (2011b). This ratio is more favorable than the 3:1 ratio (three non-lethal injuries for every one death) frequently cited for the United States; see, for example, Annest et al. (1995, p. 1751).

19   Author correspondence with Lee Annest, director, Office of Statistics and Programming, National Center for Injury Prevention and Control, CDC, 30 November 2011. The number of participating hospitals and emergency departments has changed since the initiative began. See ICPSR (2009, p. iii).

20   See IVP-31 of the Healthy People 2020 Objectives (DHHS, n.d., p. 14).

21   Author correspondence with Lee Annest, director, Office of Statistics and Programming, National Center for Injury Prevention and Control, CDC, 30 November 2011.

22   Author correspondence with Lee Annest, director, Office of Statistics and Programming, National Center for Injury Prevention and Control, CDC, 30 November 2011.

23   Non-fatal firearm assaults are ICD-9 code E965.

24   For a fuller discussion of the passage of the Firearms Control Act, its implementation phasing, and documentation of its impacts, see Small Arms Survey (2008, pp. 186–99).

25   Data in Tables 3.1 and 3.2 covers only the patients who accessed medical services. The data was extracted from Handicap International's database in Jonglei in August 2011 and represents a sample of approximately 4,000 cases admitted to hospital in the period 2008–11.

26   For a discussion of the challenges of using media reports to document armed violence, see Small Arms Survey (2005, pp. 235–38).

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