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COSTS OF PENETRATING INJURY
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Capsule

ACQUISITIONS

In 1990, gunshots killed 36,866 Americans and knife assaults 4,101. Another 134,000 gunshot survivors and 234,000 knife assault survivors received medical treatment. Annually, gunshot wounds cost \$112 billion. Half this cost is for assaults and murders, with suicide and attempts accounting for most of the rest. Knife assaults cost another \$29 billion. The cost per death exceeds \$2 million. Fatality costs vary widely with victim age. Across medically treated cases, costs average \$191,000 per gunshot survivor and \$75,000 per knife assault survivor. Medical spending per hospitalized gunshot victim averages \$25,000. This amount includes \$11,000 in hospital payments for acute care. Professional fees and follow-up care account for the rest. The largest costs, however, result from lost wage work, housework, and quality of life.

Introduction

This chapter discusses the costs of gunshot wounds and of criminally inflicted knife wounds. It has five sections. They describe:

- The range of costs that result from a penetrating injury
- A brief overview of how these costs were estimated
- Costs per injury, to the extent this is known, and cost variations by cause
- National injury incidence
- National injury cost

Range of Costs That Result from a Penetrating Injury

The costs of penetrating injuries are varied. This chapter classifies them into seven categories. Their definitions follow.

Emergency services and transport costs include costs of emergency transport, police investigation, and coroner transport for fatalities. Penetrating wounds, being more life-threatening and more frequently intentional than most injuries, also prompt police investigation more often.

Medical care costs include costs of: life support at the scene; emergency department treatment; hospital room, intensive care unit, surgical theater, and outpatient department use, and related supplies and services; professional fees of physicians and allied health providers while hospitalized and after discharge; inpatient and outpatient rehabilitation; nursing home care; and for fatalities, autopsy and burial. The most severe injuries entail a lifetime of care costs.

Mental health care costs include costs of therapy and related social services and victim services.

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Productivity losses measure loss of paid and unpaid work. The injured person's losses may include lost wages, fringe benefits, schoolwork, housework, and other household services. Family and friends may experience similar losses. Employers also may lose productivity. Supervisors may have to juggle schedules or recruit and train temporary or permanent replacements. Co-workers may be less productive because they are talking about the injury and may draw overtime pay while helping the employer to meet its obligations. Finally, unique skills may be lost.

Administrative costs may include health, life, Workers Compensation, and other disability insurance claims investigation and processing, as well as the costs of administering public welfare payments to the permanently disabled. Many analysts also include legal fees and court costs associated with injury compensation in administrative costs.

Costs of individual and family pain, suffering, and lost quality of life are intangible or non-monetary costs. Although quality of life cannot be bought and sold, people value it dearly. As explained below, economists have estimated people's values by looking at the money and time routinely spent to buy safety or by looking at jury verdicts. This chapter costs neither the good nor the evil that those who died would have done outside of their families and their jobs. For example, had the victim lived, he might have mentored or murdered the next Madonna.

Overview of Cost Estimation Methods

Only two related published studies (1, 2) estimate most dimensions of firearm costs. These studies do not differentiate gunshot wounds from injuries resulting from hitting with a firearm or firearm malfunction. No published studies cost stabbing and other penetrating wounds, although a few studies estimate the medical costs. This chapter includes original analyses that flesh out the penetrating injury cost picture.

Emergency Transport and Services Costs. Transport costs are the product of costs per transport and transport rate. Nationally, costs per admitted injury victim transported average \$221, compared to \$167 per victim transported and released (or transported to the medical examiner) according to the 1987 National Medical Expenditure Survey (NMES). An annual industry survey finds helicopter transport costs average \$2,381 (3). Cayten (4) found that 69.3 percent of penetrating injury victims admitted to eight hospitals including three Level 1 trauma centers arrived by ambulance. We used this rate. We assumed 1.13 percent of victims arrived by helicopter, the average rate for injury according to Rice et al. (2). We used the U.S. Consumer Product Safety Commission's National Electronic Injury Surveillance System estimates that 7.4 percent of admitted fracture, internal injury, and puncture wound victims are transferred between hospitals, as are 1.8 percent of similar victims who are treated in the emergency department and released. Consistent with these estimates, Morabito (5) reports that 8.4 percent of gunshot survivors arriving at an Oakland, Ca hospital were transferred to another hospital. We assume 8.1 percent of non-admitted knife and gunshot victims arrive at the emergency department by ambulance, the rate for all injuries from NMES.

Police investigation costs per case were computed using data from a few police departments on average police time spent per stabbing and per gunshot victim, and police salary and fringe benefit costs (6, 7). Presumably police respond to all penetrating wound deaths. For nonfatal wounds, we assume the National Crime Survey (NCS) response rates by hospitalization status apply.

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Medical Care Costs. For medical care, hospital charges typically exceed reimbursed amounts (payments). Neither necessarily reflects actual costs very well. Charges, for example, often are about 1.5 times costs according to 1992 Prospective Payment Advisory Committee (ProPAC) data. Only in Maryland do cost control regulations fix relationships between charges and costs; they generally require full payment of charges net of a prompt payment discount. This chapter estimates payments.

For nonhospitalized firearm injuries, Table 1 compares three estimates:

- The short-term payments per case that gunshot and knife assault victims report in the National Crime Survey. These data cover an average of three months after injury, with a range from one day to six months. One "non-admitted" gunshot case with medical costs exceeding \$20,000 and 120 days lost from work was omitted from the average as it appeared to be a miscoded hospitalized case.
- Max and Rice's (1) national estimate of payments per firearm injury. These estimates are synthetic. Rather than being directly measured costs of firearm cases, they use average costs for 15 categories of physical injury (wound, leg fracture, contusion, etc.) and 1972 data on the distribution of physical injuries caused by firearms.
- Payments per case synthesized from payments per nonhospitalized case by International Classification of Diseases (ICD) nature of injury in (7) and the distribution of nonhospitalized gunshot and knife assault victims by primary ICD code from a convenience sample of 21 emergency departments (in nine communities) that were able to supply this information.

Comparing the estimates suggests that nonhospitalized gunshot and knife wound costs cannot be synthesized accurately from the nature of the primary physical injury. These wounds involve atypically many or complex secondary injuries. Therefore, we used the NCS estimates of costs soon after injury. From the physical injury distribution and data on the temporal pattern of nonhospitalized injury payments in Miller, Pindus, et al. (7), we estimated that the NCS captures 87 percent of total medical payments.

To estimate payments for admitted patients, we first used a literature review to estimate hospital payments per firearm injury treated. The literature contains several studies of hospital charges or payments for gunshot wounds. Table 2 summarizes these studies. Most include all firearm injuries, including hospital-admitted fatalities and injuries related to hitting with a firearm or firearm malfunction. The difference probably is minimal. According to Annett (8), gunshot wounds cause 97 percent of hospitalized firearm injuries nationally. The table shows the published values for each study. It also shows values adjusted so they could be compared across studies. The latter values have been converted to 1992 dollars by multiplying times the ratio of hospital charges per day in 1992 versus the year of the study data (from American Hospital Association, various years). They adjust for geographic variations in medical prices and practices by multiplying times the ratio of national to state hospital costs per day (from the same source). Where possible, both adjusted charges per case and per day are shown. Charges per day partially control for severity differences that affect charges per case.

As with hospitalizations generally, length of stay for gunshot victims apparently dropped over time. Jett et al. (9) reported an average stay of 12.5 days for gunshot and stabbing victims in 1969 (see Table 3). Berman and Salter (10) reported an average stay of 10.75 days among police officers suffering orthopedic injuries in the 1970s and early 1980s. By 1984, the mean stay fell to 6.0 days, where it remained through 1990. The most representative lengths of stay are from pooled statewide Hospital Discharge System (HDS) data for California, Vermont, and



Washington. The HDS data come from years when these states mandated that hospitals code the external cause of injury (E-code) for each acute injury discharge. We analyzed all gunshot and knife assaults and woundings of unknown intent. Notably, lengths of stay for nonfatal gunshot wounds resulting from assault and suicide attempts are comparable.

Max and Rice (1) (which provides a more detailed description of the firearm injury costs in (2)) is the best nationally representative study. Its cost estimates, although computed from 1984-86 data, are consistent with more recent ones. The nationally representative National Crime Survey estimate comes from just 17 gunshot assaults. It relies on victim self-reporting of payments, which means it may suffer from errors in recall and respondent ignorance about payments. Furthermore, NCS collects only medical payments; our adjustment to estimate hospital payments uses injury spending pattern data that are not gunshot-specific. Allen (1) describes pediatric gunshot wounds treated in children's hospitals. Dischinger et al. (12) studies all intentional gunshot victims in Maryland's statewide trauma registry during 1988. The study excludes injuries treated in community hospitals, which may be less serious than the injuries treated in trauma centers.

Unlike with nonhospitalized injury, our synthesized payment estimates were in the low mid-range of studies that directly measured charges or occasionally, payments. This finding adds credence to the percentage of costs beyond acute care, which unavoidably comes from these data.

Martin et al. (13) is the most credible study from a single trauma center because it assessed what portion of hospitalized firearm injuries in the catchment area were treated at the trauma center. Presumably the least serious and least costly hospitalized firearm injuries are treated at community hospitals and lower levels of the trauma system. That means charges per case across all firearm injuries may be lower than the trauma center values. Martin et al. showed this was not an issue in their study; they captured 97 percent of all hospitalized firearm injuries in San Francisco during 1984. Thus, their study provides an accurate picture of admitted firearm injury severity in the city.

Nelson (14) illustrates the dangers in using small clinical samples to assess costs. It includes only two cases and fails to indicate the year of the cost data. Notice how this sample yields costs exceeding the experience in larger samples.

From the literature and the E-coded state hospital discharge data, we conclude that the average length of stay for nonfatal gunshot wounds is 6 days. We used Max and Rice's (1) estimated payments per day from Table 2. They are consistent with the local studies, our synthesized estimates, and the NCS and Dischinger data on gunshot assaults. For stabbing, we used the NCS costs per day from Table 3, which is close to the Maryland trauma registry estimate but comes from cases with more typical lengths of stay.

Using ratios of professional fees to hospital payments of .321 for gunshot wound and .312 for knife wound, we estimated total acute care costs per wound. (These estimates are nationally representative. Mock (26) found similar ratios -- .291 for gunshot wound and .367 for knife wound -- in a Seattle trauma center.) We computed lifetime medical spending from the fraction of medical spending associated with the acute care episode, .57 for gunshot wounds and .61 for knife wounds. The professional fee ratios and fractions of lifetime costs were computed using the percentages by physical injury from (7) and the distributions of primary physical injuries for gunshot and knife assault survivors in the pooled HDS data. To illustrate the computations, medical payments per hospitalized gunshot victim average \$25,000 (6 days x \$1,825 per day x 1.321 to account for professional fees / .57 of the cost in the acute phase).

Medical costs for fatalities are the all-injury average from (7).



Mental Health Care Costs. Cohen and Miller (15) surveyed 168 randomly sampled mental health care providers about treatment for victims of crime. They found that three people enter therapy for every murder committed. One in 12 assault and robbery victims enter therapy, as do 30 percent of rape victims. These estimates include cases without physical injury. We conservatively assumed other penetrating injury victims, the majority of whom attempted suicide, get mental health treatment comparable to crime victim treatment.

Productivity Losses. Lost wages and household work for fatalities are estimated from the victim age and sex distribution using the formula in Rice et al. (2). Following Miller, Cohen, and Rossman (6), we used a 2.5 percent discount rate, in the 1- to 3-percent range typically used in courtrooms when estimating injury losses (16).

Nonfatal injuries cause both temporary and permanent disability. The NCS captures only temporary disabilities. We assumed the wages and work days lost per temporarily disabling penetrating wound for crime victims (from the NCS) were typical of other penetrating wounds. On average, 1.5 times as many housework as wage work days are lost by workers, with nonworkers losing the same number of housework days (15). Douglass, Kenney, and Miller (17) gives formulas for valuing lost housework. We computed the values using 1991 demographic data.

Crude probabilities of permanent total and permanent partial disability by hospitalization status were computed from the data in (7) using the same weighting procedure as for the percentage of lifetime medical costs associated with acute care. Total disability causes as much productivity loss as death. Partial disability causes 17 percent loss on average (18).

Psychological injury also can tax productivity. We estimated the losses from crime-specific ratios of mental health care costs to productivity losses associated with mental health care treatment from (15).

Employer productivity losses are order-of-magnitude estimates derived from assumed days lost per person by severity and employment status from (19).

Administrative Costs. We applied a health insurance claims processing expense of 7.5 percent to the medical care costs. This average comes from the Consumer Product Safety Commission's Injury Cost Model. It describes the payer's administrative cost; treatment costs include the provider's administrative expenses. For lack of data, we ignored legal costs involved in compensating injuries caused by other peoples' willful or neglectful acts.

Pain, Suffering, and Lost Quality of Life. When U.S. government agencies value life-saving benefits in regulatory analysis, they are required to use a method that costs lost quality of life and familial pain and suffering (20). The method used looks at how much money, time, and comfort people routinely pay for safety. For example, it looks at decisions to buy smoke detectors, use safety belts, and drive more slowly during rainstorms. These decisions suggest that people pay an average of \$250 to reduce their risk of death by 1 in 10,000. That implies valuing the loss of a life at \$2.5 million ($\$250 \times 10,000$). Economists generally describe these costs as willingness to pay values. We recommend the more descriptive name comprehensive injury costs, as these costs include both the monetary and nonmonetary losses that result. They include after-tax wage losses and lost housework and fringe benefits, as well as quality of life losses. We tailored values by age group assuming the value of a life year was constant over the lifespan

This chapter provides two estimates of the losses associated with nonfatal hospitalized injuries. The primary estimates (shown in Table 4) come from a regression analysis of jury awards for pain and suffering due to nonfatal gunshot or stab wounds or other criminal victimizations (21). The estimated medical and productivity losses were substituted in the



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regressions to arrive at the estimates. The secondary estimates -- \$165,000 for either stab or gunshot wound -- are of the same order of magnitude as the jury verdicts. They were computed from the HDS distribution of primary physical injuries, comprehensive costs by physical injury in (7), and the expected productivity losses.

Costs Per Victim

Table 4 summarizes the costs per penetrating injury victim. The average fatality cost more than \$2.3 million. Fatality costs vary with victim age. They are \$2.8 million per knife murder, \$2.6 million per gun murder or unintentional death, but only \$2.1 million per suicide.

Hospitalized gunshot victimizations average \$319,000. Of this total, \$64,000 is monetary cost -- costs of goods and services that can be bought and sold (including \$28,000 in what economists call direct costs and almost \$43,000 in indirect productivity losses). The rest is the value of lost quality of life. Hospitalized knife assaults are much less costly, averaging about \$186,000. Including emergency department cases, nonfatal gunshot costs average \$191,000 per victim, more than double knife assault costs of \$75,000. The mental health care costs are higher for knife assault than gunshot victims because some knife assaults involve rape.

With guns, proximity and intent both improve aim. Aiming, in turn, raises gunshot costs. As Tables 5 and 7 show, severity differences make suicide-related gunshot wounds the most costly. The least costly wounds are unintentional. This pattern holds even when fatalities are excluded.

National Incidence

Tables 6 and 7 present gunshot and stabbing victim counts. Overall, 4,533 people died of knife wounds and 36,866 people died of gunshot wounds in the United States in 1990 (22). The gunshot death count excludes 318 deaths resulting from legal intervention. Judging from data on victims who reached the hospital door, it includes perhaps 200 BB and pellet gun victims. We allocated gunshot deaths of unknown intent in proportion to deaths of known cause.

Annest (8) used six months of 1992 data collected using the Consumer Product Safety Commission's National Electronic Injury Surveillance System (NEISS) to estimate the number of nonfatal firearm injuries seen in emergency departments in 1992. Annualizing these estimates ignores any seasonal trends. Annest found that 6 percent of the bullet wounds were suicide attempts (with many other wounds of unknown cause). We assumed that 90 percent of these cases were hospitalized. We did not use the NCS gunshot assault count of 19,842 because Cook (23) showed it is a substantial undercount. Instead, applying the case-fatality ratio of .13 from Loftin (24) to the police-reported gun murder count yielded an estimate of police-reported gunshot assaults. We allocated these nonfatal assaults among treatment modalities proportionally with the modalities of police-reported gun assaults in the National Crime Survey (NCS), then added the NCS injuries not reported to the police. The estimated gun assaults are five times the NCS count. Subtracting the counts by hospitalization status for assault and suicide attempts from Annest's total yielded the unintentional injury counts.

We checked our estimates using an alternative computation. This time, we allocated gunshot hospitalizations in proportion to the California HDS gunshot wound cause distribution. This procedure yields hospitalization counts of 10,700 unintentional, 44,700-46,600 assault, and 4,000-5,900 suicide. The two sets of estimates are consistent.



27



To estimate nonfatal criminal knife wound victims by treatment status, we multiplied the gunshot victim counts times the ratios of knife to gunshot victims in our CA/VT/WA HDS and emergency-department data sets. Had we estimated the number of criminal knife wound survivors treated only in emergency departments from the percentage distribution of treatment modalities in the NCS, our estimate would be 184,000 rather than 180,000. This close agreement improves our confidence in the estimates. Other hospitalized stabbing victims were estimated by assuming they were proportional in frequency to cases in the California HDS data. We could not estimate the number of nonfatal, nonhospitalized stabbing victims.

National Cost Estimates

The costs of gunshot wounds in 1992 exceeded \$112 billion. This figure includes the nonmonetary costs of pain, suffering, and lost quality of life, not just money that flows through the economy. It represents more than \$450 per U.S. resident.

Table 8 shows gunshot assault was the largest cost factor, followed by suicidal gunshot wounds. Knife assaults cost \$29 billion per year, about one fourth as much as gunshot assaults. The total cost of treated and released knife assaults exceeded the total costs for admitted cases. Shootings of children and youth through age 21 accounted for more than 7,000 of the deaths and as Table 9 shows, \$33 billion of the costs. Victims age 22-34 accounted for more than a third of the costs. Assault is the major cause. Suicide dominates the costs after age 44. Both gunshot fatalities and survivors are 85-percent male.

As Figure 1 shows, direct medical spending, claims processing, and emergency services costs alone totalled \$2.9 billion -- about 0.5 percent of total medical spending in 1992 (U.S. Statistical Abstract, Table 135, 1993). By comparison, 1990 civilian firearm sales were about \$2.1 billion (U.S. Statistical Abstract, Table 406, 1991, inflated to 1992 dollars). At wholesale, ammunition sales were about \$491 million in 1992, including sales to police departments. Taxes on the ammunition sales were \$54 million (25). The least costly bullets in our local gun shops retail for about \$.16. Thus, as a rough approximation, the wholesale pre-tax price per bullet might average \$.10, implying 4.91 billion bullets sold in 1992.

Although there is a great deal of truth to the adage that "guns do not kill, people do," it still is of some interest to examine the injury cost per bullet sold in the U.S. We estimate this cost is almost \$23. It includes:

- \$.60 in direct costs for medical care and emergency services
- \$7.20 in lost earnings and housework
- \$15.10 in pain, suffering and lost quality of life.

We lack the nonfatal injury data needed to break these costs down accurately between self-inflicted costs and external costs -- ones to third parties, including victims, government, health care providers, and health insurers. The likely order-of-magnitude of the external costs is around \$14 per bullet, including \$.55 in direct costs and \$13.50 in lost work and quality of life. The remaining costs result from suicides and self-inflicted unintentional injuries of adult gun users.

These figures are for the average bullet. The vast majority of bullets, however, impose no costs, while a few impose large costs on third parties.



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The issue of recovering these costs by taxing ammunition is controversial. There are two possible reasons to impose such a tax -- deterrence and compensation. Taxing ammunition for deterrence purposes is likely to result in a misallocation of resources; responsible firearm users would pay higher prices for their legitimate needs (e.g., recreation or security), while irresponsible users would be charged too low a price for the risk they impose. Thus, a tax is likely to have little deterrent effect on those who most need deterrence and an overdeterrent effect on others.

The compensation rationale is intended to recover some of the external costs of gunshot wounds. Although this is less desirable than obtaining reimbursement for costs directly from perpetrators, few perpetrators have the resources to pay for the damages they inflict. If one attempted to recover just the costs that government and the health care system pay for investigation and treatment, the tax would be about \$.55 per bullet. Of course, legitimate users of firearms, not those who use them maliciously or carelessly, would pay most of this tax.

Comparison to Prior Estimates. To compare our cost estimates with Max and Rice (1), we exclude quality of life, mental health, police investigation, and employer costs. Our estimate of \$36.3 billion is much higher than Max and Rice's estimate of \$22.1 billion (inflated to 1992 dollars). The dominant reason for this gap is that Max and Rice used a 6-percent discount rate in valuing fatal productivity loss while we used 2.5 percent. At our discount rate, Max and Rice's estimate also would be about \$36 billion. Other differences are that Max and Rice include permanent disability losses only for hospitalized injury and that their synthetic estimate of medical care costs for nonhospitalized injuries is much lower than the gunshot-specific NCS experience. Also, their costs include firearm injuries unrelated to ammunition and gunshot wounds that were not medically treated but were temporarily disabling.

Max and Rice state that their estimates probably "grossly underestimate the economic impact of firearm injuries in the United States." The estimates here are more complete. Still, they are imperfect. They involve many assumptions and combine data that are not fully compatible. Despite their flaws, they clearly document the tragedy of penetrating injury.



Table 1. Payments for Acute Care of Nonhospitalized Firearm and Knife Wounds (in 11/92 dollars)

Lead Author/Source	Years	Place	Gunshot Cases	\$/case	Knife Cases	\$/case
Pooled Emergency Department Data on Assault and Generic Injury Costs by ICD	1989-90	Ca/Vt/Wa	1,433	\$409	7,515	\$408
Nat'l Crime Survey	1987-90	US	11	4,696	62	2,234
Max (1)	1985	Md/US	?	377		



Table 2. Hospital Length of Stay (LOS) and Charges/Payments for Acute Inpatient Care of Firearm/Gunshot Victims (in November 1992 dollars)

Lead Author/Source	Years	Place	Cases	LOS	\$/case	Adjusted \$/case	Adjusted \$/day	% Fatal
<u>National/Catchment Area Studies</u>								
Max (1)	1985	MD/US	?	?	\$5,842 ¹	\$10,953	\$1,825 ²	0%
Nat'l Crime Survey	1987-90	US	17	5.3 ³	8,211 ¹	11,189	2,110	0%
Martin (13)	1984	SF	131	6.2	6,915	9,930	1,602	8%
Allen (pediatric, 11)	1991	US	536	7.3	14,434	15,779	2,153	5%
<u>Synthesized Estimates Derived from Pooled CA/WA/VT E-coded Hospital Discharge Survey (HDS) Data Combined with Generic Injury Costs by ICD</u>								
Assault	1989-90		3,078	6.0	8,606 ¹	10,286	1,705	0%
Unknown Intent	1989-90		279	5.7	5,872 ¹	7,019	1,228	0% ¹
<u>Trauma Center Studies</u>								
Dischinger (12)	1988	MD	566	9.7	12,298	17,902	1,846	10%
Morabito (5)	1987-88	Oakland	215	5.0 ⁴	11,517	12,657	2,531	20%
Mock (26)	1992	Seattle	1,116	8.2	14,541	12,311	1,501	22%
Webster (27)	1988	DC	385	6.0 ⁵	14,757 ⁶	14,655	2,443	22%
Wintemute (28)	1984-85	DavisCa	250	8.2	13,190	17,393	2,121	7%
Hayashi (29) (cardiovascular only)	1980-90	SF	134	11.6	14,937	13,824	1,194	10%
Nelson (14) (femoral fracture only)	?	Ark	2	10	17,084	?	?	0%

¹Payments rather than charges.

²Computed using the 6-day length of stay from Ca/Vt/Wa HDS data.

³Mean shown is for 10 cases with known charges. Including cases without known charges, the mean is 7.6 days.

⁴The study was restricted to victims under age 25. For all 501 gunshot admissions, length of stay averaged 5.8 days.

⁵Median rather than mean.

⁶Costs rather than charges.



Table 3. Hospital Length of Stay (LOS) and Charges/Payments for Acute Inpatient Care of Stabbing and Penetrating Injury Victims

PENETRATING INJURIES

Lead Author/Source	Years	Place	Cases	LOS	\$/case	Adjusted \$/case	Adjusted \$/day	% Fatal
<u>Trauma Center Studies</u>								
Jett (9)	1969	Charlotte	254	12.5	\$1,046	\$5,004	\$400	4%
Clancy (30)	1988-91	NC	211	6.0	9,783	15,490	2,582	21%

STABBING

National/Trauma Center Studies

Nat'l Crime Survey	1987-90	US	28	3.8	4,067 ¹	5,351	1,428	0%
Dischinger (12)	1988	MD	354	5.3	5,603	8,156	1,539	1%
Mock (26)	1992	Seattle	1,529	4.9	6,446	5,457	1,114	4%

Synthesized Estimates Derived from Pooled CA/VT/WA E-coded Hospital Discharge Survey (HDS) Data Combined with Generic Injury Costs by ICD

Assault	1989-90		3,791	3.9	3,735 ¹	4,464	1,157	0%
Intent Unknown	1989-90		82	4.9	4,548 ¹	5,436	1,105	0%



Table 4. Costs per Gunshot or Stabbing Victim by Severity (in 11/92 dollars)

<u>Category</u>	<u>Gunshot Wound</u>			<u>Knife Assault</u>		
	<u>Fatal</u>	<u>Hosp</u>	<u>ED Only</u>	<u>Fatal</u>	<u>Hosp</u>	<u>ED Only</u>
Medical Care	\$14,137	\$25,177	\$4,271	\$14,137	\$11,466	\$2,571
Mental Health Care	4,477	136	109	4,477	147	146
Emergency Transport	347	196	17	347	196	17
Police Services	1,345	621	543	1,345	290	288
Insurance Administration	1,396	1,898	329	1,396	871	204
SUBTOTAL -- Direct	21,702	28,028	5,269	21,702	12,970	3,226
Productivity Lost						
To Physical Injury	840,926	41,297	1,834	931,945	32,679	1,456
To Psychological Injury	2,555	78	62	2,555	84	83
By Other Employees	5,075	1,246	200	5,075	1,220	231
SUBTOTAL -- Indirect	848,556	42,621	1,897	939,575	33,983	1,770
SUBTOTAL -- Pain, Suffering, and Lost Quality of Life						
Quality of Life	1,463,388	248,160	75,427	1,842,751	139,096	39,877
TOTAL	2,333,646	318,809	82,593	2,804,028	186,049	44,873

Table 5. Cost per Victim, Including Fatalities, and per Survivor for Penetrating Injuries by Intent (in 11/92 dollars)

	<u>Any Victim</u>	<u>Survivor</u>
GUNSHOT		
Assault	\$616,000	\$215,000
Suicide/Attempt	1,640,000	209,000
Unintended	219,000	145,000
Any Gunshot	655,000	191,000
KNIFE		
Assault	\$123,000	\$75,000



Table 6. Incidence of Nonfatal Firearm Injuries Treated in Hospital Emergency Departments, by Wounding Agent and Severity, United States, 1992

<u>Wounding Agent</u>	<u>Admitted</u>	<u>Emergency Room Only</u>	<u>Total</u>	<u>% Admitted</u>
Bullet	58,912	43,440	102,352	58%
B-B, Pellet	2,432	29,242	31,674	8%
ALL GUNSHOT	61,344	72,682	134,026	46%
Other Firearm	1,736	24,672	26,408	7%
ALL FIREARM	63,080	97,354	160,434	39%

Source: Annest (8), estimated using 6 months of preliminary 1992 data from the NEISS Nonfatal Firearm Injury Surveillance Study.

Table 7. Incidence of Gunshot and Knife Wound by Intent and Severity, 1990

<u>Nature/Intent</u>	<u>Fatal</u>	<u>Admitted</u>	<u>ED Only</u>	<u>SubTotal</u>	<u>Case-Fatal Ratio</u>	<u>Untreated Survivor</u>
GUNSHOT						
Assault	16,379	46,849	34,438	97,666	0.17	9,000
Suicide/Attempt	19,071	5,527	614	25,212	0.76	?
Unintended	1,416	8,968	37,630	48,014	0.03	?
All Gunshot	36,866	61,344	72,682	170,892	0.22	?
KNIFE						
Assault	4,101	49,215	180,601	233,917	0.02	114,494
Suicide/Attempt	425	14,370	?			
Unintended	108	23,719	?			

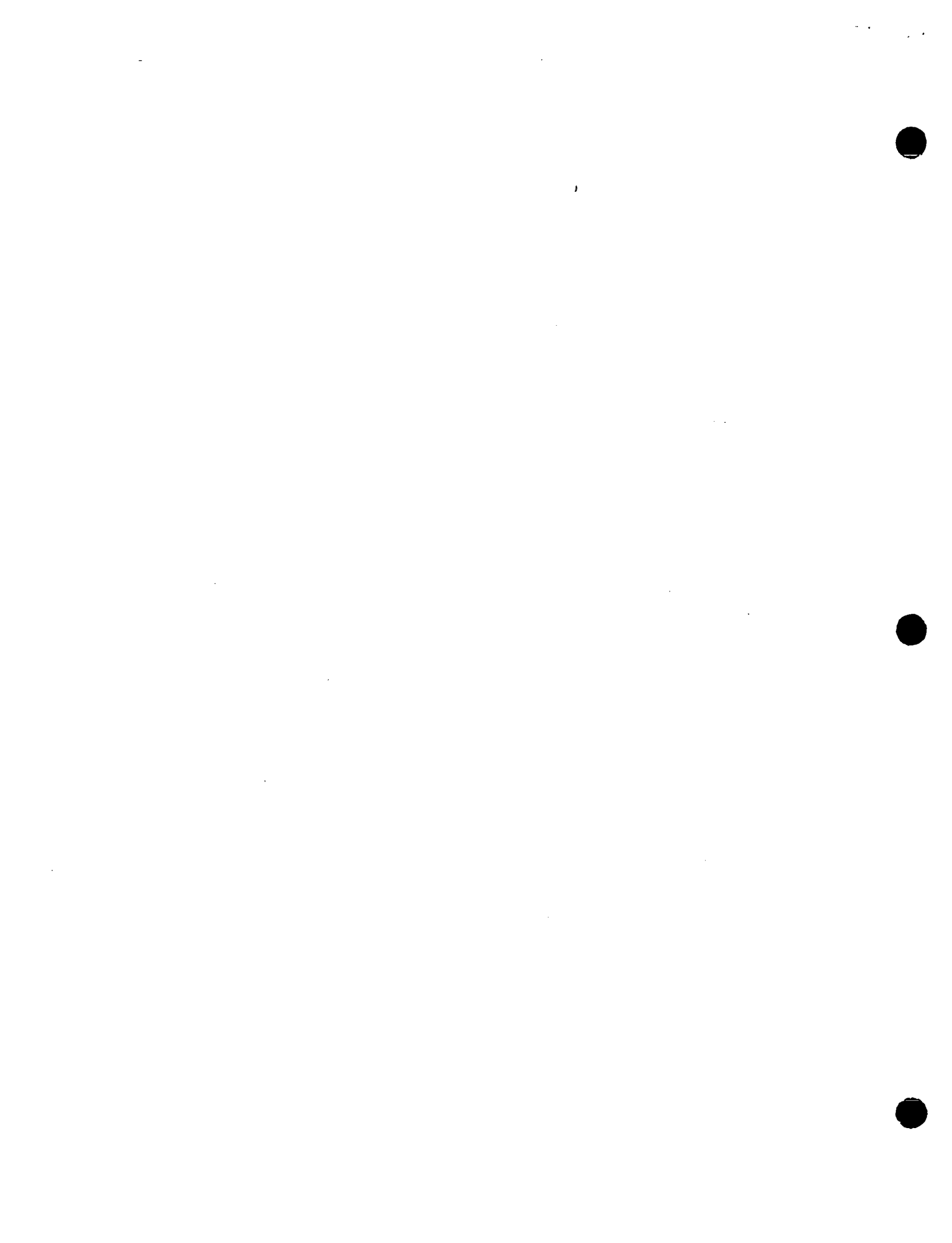


Table 8. Total Costs of Gunshot Wounds and Knife Assaults, by Cause and Severity, United States, 1992 (B = billions of 11/92 dollars)

<u>Cause</u>	<u>Fatal</u>	<u>Admitted</u>	<u>ED Only</u>	<u>Total</u>
GUNSHOT				
Assault	\$42.6B	\$14.9B	\$2.6B	\$60.1B
Suicide/Attempt	40.0B	1.3B	0.1B	41.4B
Unintended	3.7B	3.4B	3.4B	10.5B
All Gunshot	86.4B	19.6B	6.0B	112.0B
KNIFE				
Assault	\$11.5B	\$9.2B	\$8.1B	\$28.8B

Note: Excludes gunshot deaths due to legal intervention.

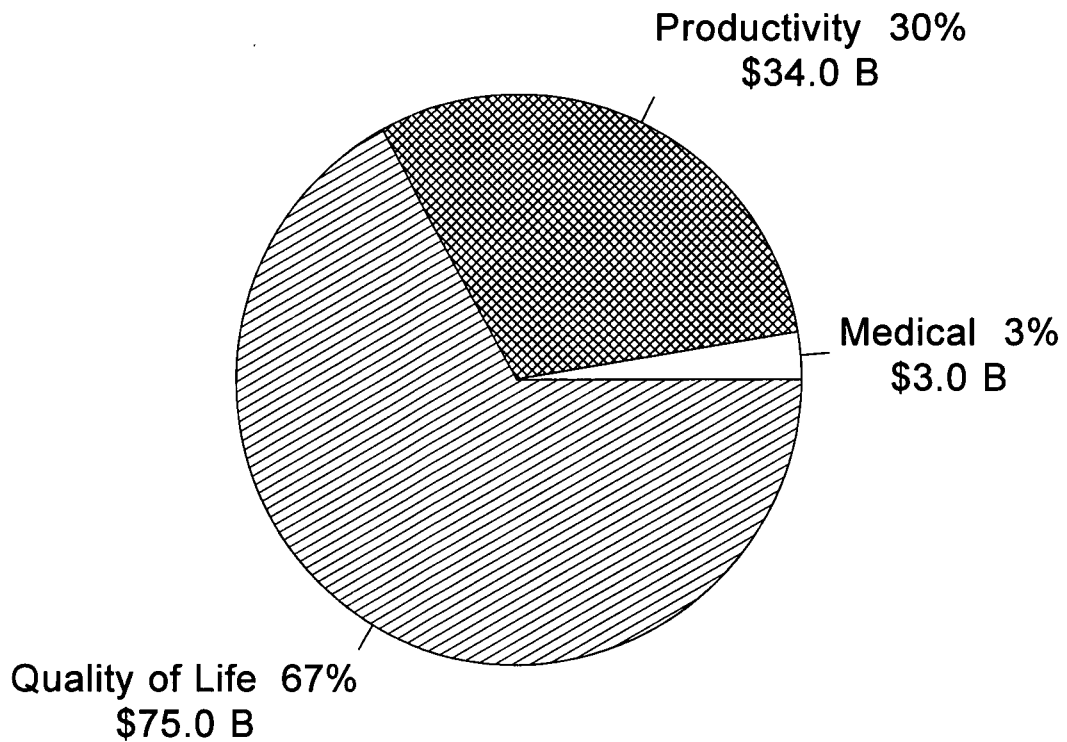
Table 9. Total Costs of Gunshot Wounds by Age Group, Broken Down Separately By Cause and By Cost Category, United States, 1992 (B = billions of 11/92 dollars)

	<u>0-14</u>	<u>15-21</u>	<u>22-34</u>	<u>35-44</u>	<u>45-64</u>	<u>GE65</u>	<u>Total</u>
Assault	\$2.5B	\$17.3B	\$25.5B	\$10.1B	\$4.2B	\$0.6B	\$60.2B
Suicide/Attempt	0.5B	6.5B	13.3B	8.3B	8.8B	3.9B	41.3B
Unintended	3.7B	2.6B	2.4B	1.0B	0.6B	0.2B	10.5B
TOTAL	6.7B	26.4B	41.2B	19.4B	13.6B	4.7B	112.0B
Medical/Direct	0.3B	0.8B	1.0B	0.4B	0.3B	0.1B	2.9B
Productivity	1.1B	8.2B	14.5B	7.0B	3.0B	0.3B	34.1B
Quality of Life	5.3B	17.4B	25.7B	12.0B	10.3B	4.3B	75.0B

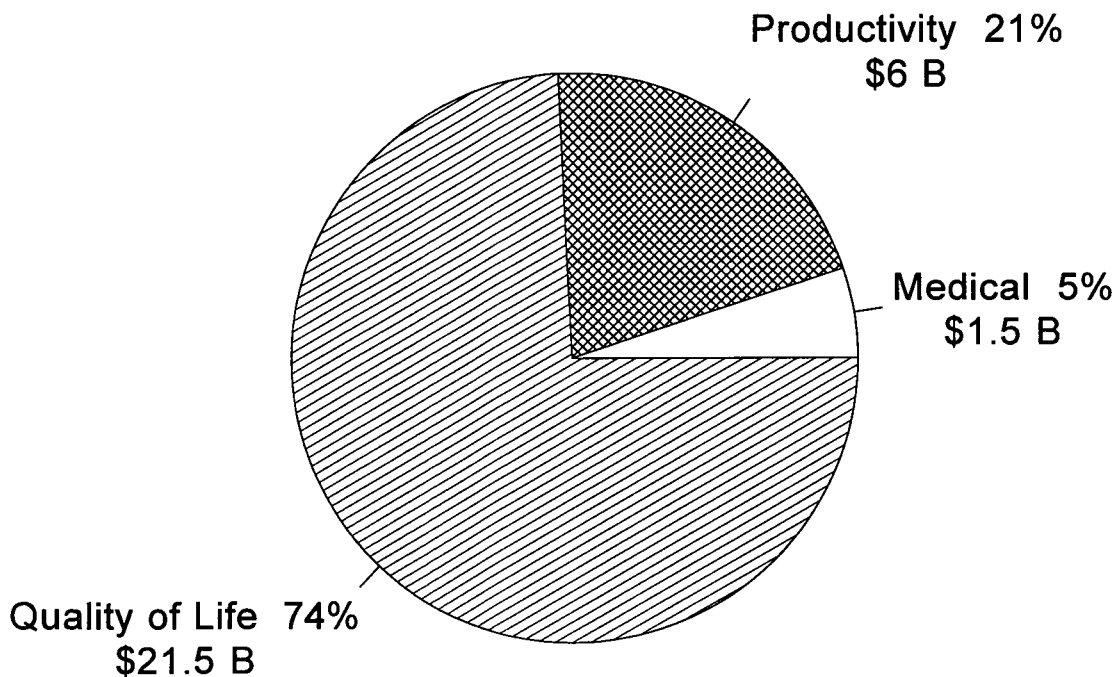
Note: Excludes gunshot deaths due to legal intervention.



Costs of Gunshot Wounds: \$112 Billion/Year



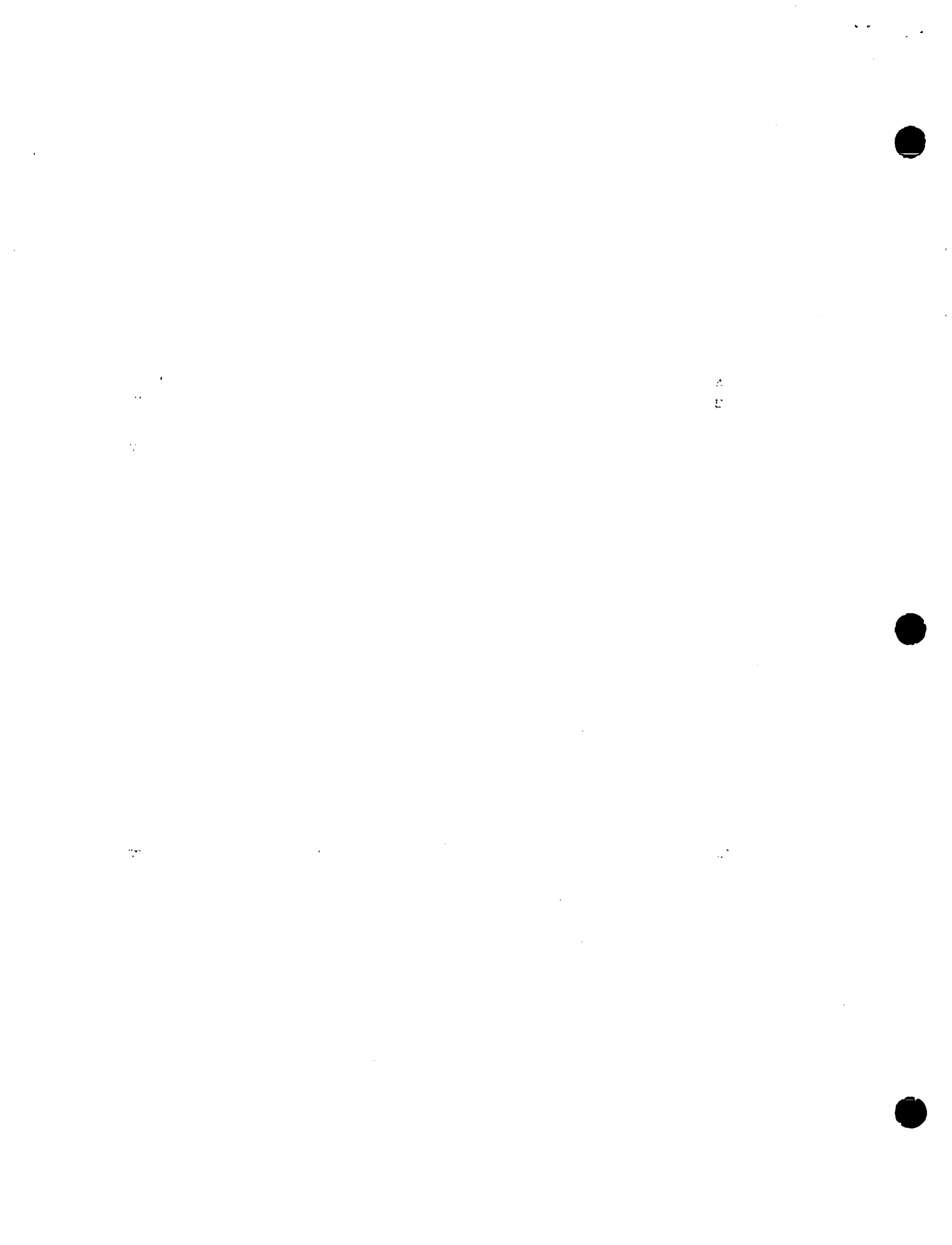
Costs of Knife Assaults: \$29 Billion/Year





References

1. Max, W, DP Rice. Shooting in the dark: Estimating the cost of firearm injuries, *Health Affairs*, 12:4, 171-185, 1993.
2. Rice, DP, EJ MacKenzie, and Associates. *Cost of injury in the U.S.: A report to Congress*, San Francisco, CA: Institute for Health and Aging, University of California, and the Johns Hopkins University, 1989.
3. Miller, TR, PA Brigham, MA Cohen, JB Douglass, et al., Estimating the costs to society of cigarette fire injuries, Report to Congress in Response to the Fire-Safe Cigarette Act of 1990, Vol. 6, Washington, DC: U.S. Consumer Product Safety Commission, 1993.
4. Cayten, G (NY Medical College). Personal communication, 1994.
5. Morabito, D (Alameda County Health Services Agency). Letter report to Rick Sinor, CA Department of Justice, 1989.
6. Miller, TR, MA Cohen, and SB Rossman. Victim costs of violent crime and resulting injuries, *Health Affairs*, 12:2, 186-197, 1993.
7. Miller, TR, NM Pindus, JB Douglass, and SB Rossman. *Nonfatal injury costs and consequences: A data book*, Washington, DC: The Urban Institute Press, forthcoming, 1994.
8. Annet, L. Incidence of firearm injury treated in emergency departments, Presentation, Second World Injury Conference, 1993.
9. Jett, HH, JM Van Hoy, HF Hamit. Clinical and socioeconomic aspects of 254 admissions for stab and gunshot wounds, *Journal of Trauma*, 12:2, 577-580, 1972.
10. Berman, AT, Salter, F. Low-velocity gunshot wounds in police officers, *Clinical Orthopedics*, 192, 113, 1985.
11. Allen, I. Financial impact on inpatient resources in children's hospitals caused by firearm injuries: CY 1991, Alexandria, VA: National Association of Children's Hospitals and Related Institutions, Inc., 1993.
12. Dischinger, PC, BM Cushing, SM Ho, TJ Kerns, JT Dailey. The hospital costs of intentional injury treated in Maryland, Presentation, American Public Health Association, 1992.
13. Martin MJ, TK Hunt, SB Hulley. The cost of hospitalization for firearm injuries, *JAMA*, 260:20, 3048-3050, 1988.



14. Nelson, CL, CL Puskarich, A Marks. Gunshot wounds: Incidence, costs, and concepts of prevention. *Clinical Orthopedics*, 222, 114-121, 1987.
15. Cohen, MA, TR Miller. Mental health care for crime victims: Incidence and costs, Working Paper, Vanderbilt University, 1994a.
16. U.S. Supreme Court. *Jones and Laughlin Steel Corp. v. Pfeifer*, 103 Supreme Court Reporter, Washington, DC, 2541-2558, 1983.
17. Douglass, JB, GM Kenney, TR Miller. Which estimates of household production are best?, *Journal of Forensic Economics*, 4:1, 25-46, 1990.
18. Berkowitz, M, JF Burton Jr. Permanent disability benefits in Workers' Compensation, W.E. Upjohn Institute for Employment Research, Kalamazoo, MI, 1987.
19. Miller, TR. The cost of injuries to employers: A traffic safety compendium, Report HS 807-970, Washington, DC: National Highway Traffic Safety Administration, 1993.
20. U.S. Office of Management and Budget. *Regulatory Program of the United States*, Washington, DC: U.S. Government Printing Office, 1989.
21. Cohen, MA, TR Miller. Quantifying the pain and suffering of crime victims, Working Paper, Vanderbilt University, 1994b.
22. National Safety Council. *Accident Facts*, Itasca, IL, 1993.
23. Cook, P. The case of missing victims: Gunshot woundings in the National Crime Survey, *Journal of Quantitative Criminology*, 1:1, 91-102, 1985.
24. Loftin, C (University of Maryland). Personal communication, 1993.
25. McCarron, S, Public Affairs Office, Bureau of Alcohol, Tobacco, and Firearms. Personal communication, October 1993.
26. Mock C, S Pilcher, R Maier. Comparison of the costs of acute treatment for gunshot and stab wounds: Further evidence of the need for firearms control. *Journal of Trauma*, 36:4, 516-52, 1994.
27. Webster, DW, HR Champion, PS Gainer, L Sykes. Epidemiologic changes in gunshot wounds in Washington, DC, 1983-1990, *Archives of Surgery*, 127, 694-698, 1992.
28. Wintemute, GJ, MA Wright. Initial and subsequent hospital costs of firearm injuries, *Journal of Trauma*, 33:4, 556-560, 1992.



29. Hayashi, E, MM Knudson, RC Lim, W Max, E McLoughlin. Gunshot wounds in the cardiovascular system: The economic impact, Presentation, Northern California Committee on Trauma Annual Meeting, 1992.
30. Clancy, TV, LN Misick, D Covington, MP Churchill, JG Maxwell. The financial impact of intentional violence on the community hospital, Journal of Trauma, forthcoming, 1994.

Recommended Readings

Martin MJ, TK Hunt, SB Hulley. The cost of hospitalization for firearm injuries, JAMA, 260:20, 3048-3050, 1988.

Max, W, DP Rice. Shooting in the dark: Estimating the cost of firearm injuries, Health Affairs, 12:4, 171-185, 1993.

Miller, TR, MA Cohen, and SB Rossman. Victim costs of violent crime and resulting injuries, Health Affairs, 12:2, 186-197, 1993.

Rice, DP, EJ MacKenzie, and Associates. Cost of injury in the U.S.: a report to Congress, San Francisco, CA: Institute for Health and Aging, University of California, and the Johns Hopkins University, 1989.

