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Social cost of land mines in four countries: Afghanistan, Bosnia, Cambodia, and Mozambique

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Abstract

Objectives—To document the effects of land mines on the health and social conditions of communities in four affected countries.

Design—A cross design of cluster survey and rapid appraisal methods including a household questionnaire and qualitative data from key informants, institutional reviews, and focus groups of survivors of landmines from the same communities.

Setting—206 communities, 37 in Afghanistan, 66 in Bosnia, 38 in Cambodia, and 65 in Mozambique.

Subjects—174 489 people living in 32 904 households in the selected communities.

Main outcome measures—Effects of land mines on food security, residence, livestock, and land use; risk factors: extent of individual land mine injuries; physical, psychological, social, and economic costs of injuries during medical care and rehabilitation.

Results—Between 25% and 87% of households had daily activities affected by land mines. Based on expected production without the mines, agricultural production could increase by 88-200% in different regions of Afghanistan, 11% in Bosnia, 135% in Cambodia, and 3-6% in Mozambique. A total of 54 554 animals was lost because of land mines, with a minimum cash value of \$6.5m, or nearly \$200 per household. Overall, 6% of households (1964) reported a land mine victim; a third of victims died in the blast. One in 10 of the victims was a child. The most frequent activities associated with land mine incidents were agricultural or pastoral, except in Bosnia where more than half resulted from military activities, usually during patrols. Incidences have more than doubled between 1980-3 and 1990-3, excluding the incidents in Bosnia. Some 22% of victims (455/2100) were from households reporting attempts to remove land mines; in these households there was a greatly increased risk of injury (odds ratio 4.2 and risk difference 19% across the four countries). Lethality of the mines varied; in Bosnia each blast killed an average of 0.54 people and injured 1.4, whereas in Mozambique each blast

killed 1.45 people and wounded 1.27. Households with a land mine victim were 40% more likely to experience difficulty in providing food for the family. Family relationships were affected for around one in every four victims and relationships with colleagues in 40%.

Conclusions—Land mines seriously undermine the economy and food security in affected countries; they kill and maim civilians at an increasing rate. The expense of medical care and rehabilitation add economic disability to the physical burden. Awareness of land mines can be targeted at high risk attitudes, such as those associated with tampering with mines.

Introduction

The problems of land mines left after armed conflicts have been increasingly publicised in recent years and are now recognised as reaching crisis proportions in many countries.^{1,2} At the United Nations' conference in Geneva in July the Secretary General, Dr Boutros-Boutros Ghali, called for a total ban on the manufacture, trade, and use of land mines, akin to the ban on chemical warfare.

Immediate action is required to reduce the risks of existing land mines. Programmes to remove the devices, to increase the awareness of communities, and to rehabilitate the victims are running in Afghanistan, Bosnia, Cambodia, and Mozambique. But they are hampered by lack of resources and, sometimes, lack of knowledge of how best to focus efforts to tackle this plague.

It may cost as little as \$3 to produce a land mine.³ It costs \$300-\$1000 to remove one.⁴ Reliable international figures do not exist, but the Red Cross estimates that land mines kill about 800 people and injure thousands each month.⁵ Victims of land mine blasts often require extensive and prolonged medical care and rehabilitation, which is not usually available from already poorly funded and overstretched health services.⁶ Most data on land mine incidents come from

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rehabilitation or medical facilities.^{7,8} But many victims do not have contact with the services. The worst impact is often on remote communities in poor countries; many victims die alone and far from help.

An estimated 110 million land mines currently exist on the earth,⁹ and the number is constantly increasing as the number of new mines laid exceeds the rate of removal. Several million land mines were laid during the civil conflicts in Afghanistan, Cambodia, Mozambique, and Bosnia-Herzegovina; in some of these countries the laying of mines continues. Surveys of communities in these four countries between May 1994 and March 1995 provided us with a unique opportunity to investigate the social costs of land mines.

Methods

Information from communities was obtained from Afghanistan, Bosnia, Cambodia, and Mozambique by means of sentinel community surveillance. The aim of this approach is to obtain data of priority issues in a way that can be used to precipitate local preventive actions.^{10,11} A key feature is linkage of qualitative data with coterminous quantitative data obtained from cluster surveys. The sentinel communities can be chosen to represent a region or country, so aggregated survey data can be used for national and regional as well as local planning.

The sites in Cambodia, Mozambique, and Bosnia were selected by multistage stratified sampling to be as representative as possible of each country, given the absence of reliable sampling frames and restrictions on movement. The data should not be interpreted as a complete national picture. The Afghanistan sites represent only provinces to which there was ready access. The sample reflected the situation in three distinct population groups: resident communities, Kuchi (nomad) bands, and displaced people and refugees in camps.

The same questionnaire, with minor changes to suit each country, was used in all communities. Questions were asked on whether land mines had caused a change in residence; the effects of land mines on daily living activities; the numbers of livestock kept and numbers lost to land mines; the amount of agricultural land held and reduction in land use because of land mines; food security during the previous month; attempts to remove land mines; age, sex, occupation, and education of victims; activities at the time of incidents; medical and rehabilitation costs; and effects of the injuries on family and work life. The research team of five to eight interviewers covered all contiguous households in each site until they had achieved the number assigned for the national pictures. The statistical handling of this method is discussed in detail elsewhere.^{12,13} Key informants in each community were asked about changes in agricultural production patterns related to the presence of land mines and local prices of livestock and farm produce. People who had been disabled by land mines were recruited in each community to a focus group to delve into the perceptions of victims.

Data entry, cleaning, and analysis relied on EpiInfo. Risk analysis was based on sequential stratification using the Mantel-Haenszel procedure.^{14,15} Contrasts are expressed as the odds ratio or risk difference.¹⁶ Confidence intervals are those of Miettinen.¹⁷ Heterogeneity between strata was tested using the procedure proposed by Zelen.¹⁸

Results

The household questionnaire yielded information about 174 489 people in 206 communities (table I). In Afghanistan 7% of resident and refugee householders

(502/7273) said that they had been obliged to move or could not return to their homes because of land mines. In Bosnia some 28% of the population (8749/31 246) was displaced (only a small part of this could be attributed directly to mines); 22% of those interviewed (6874/31 246) said that they occupied households vacated by "the other side" during the infamous "ethnic cleansing." In Cambodia 22% of households (1359/6090) and in Mozambique 2% of households (180/9134) said that they had been forced to leave because of land mines. Many households reported that their daily activities were affected by land mines, ranging from 19% (1735/9134) in Mozambique to 78% (1617/2067) in parts of Afghanistan. Farming, wood cutting, and herding were the activities most restricted.

TABLE I—Populations studied in the four countries

	No of households interviewed	Study population	No of sites
Afghanistan:			
Residents	5 184	39 971	24
Nomads	1 432	11 381	6
Refugees	2 089	15 250	7
Bosnia	8 975	31 246	66
Cambodia	6 090	33 950	38
Mozambique	9 134	42 691	65
Total	32 904	174 489	206

Without land mines the agricultural land use in the Afghani sample could be increased by 88%-200% above the currently farmed 71 945 hectares. In Bosnia it could increase by 11%—a further 861 hectares above the 7556 now cultivated by our sample. In Cambodia the increase would be about 135%—6608 hectares on top of 4904 currently cultivated. In Mozambique a 3-6% national increase over the 14 179 hectares currently farmed would represent employment for some 10% of the sample population.

A total of 57 339 animals were reported lost to land mines, with a minimum local market value of \$6 547 000 (just under \$200 per household) across the whole sample. In Afghanistan the bulk of the loss was suffered by the Kuchi (nomads), who reported losses of nearly 35 000 animals; this is an average of 24.4 animals per household, or \$2933 at local market prices.

Except in Bosnia, most households did not have sufficient food in the previous month, and they had experienced difficulty in providing food for their families. As might be expected from the most expensive relief operation in modern history, nearly all of the Bosnian population had received food aid; on average, households had enough food stored for four months. Across the four countries, households with a mine victim were 40% more likely to report difficulty in providing food for the family (odds ratio 1.4 (95% confidence interval 1.2 to 1.6); stratified analysis).

VICTIMS OF LAND MINES

The household study identified a total of 2100 victims of land mines, affecting around 6% (1964/32 904) of households overall (table II). Prevalence was as high as 22% in parts of Afghanistan. One in three

TABLE II—Details of land mine accidents in the four countries

	No of victims	No (%) of households affected	No (%) killed
Afghanistan*	1265	1034 (12)	699 (55)
Bosnia†	195	242 (3)	79 (41)
Cambodia	443	432 (7)	136 (31)
Mozambique	197	256 (3)	83 (42)

*In only certain provinces.

†May be underestimates because some incidents were viewed as being of military importance.

died in the blast. The age and sex specific rates of land mine incidents are largely explained by the occupation of victims and their activity at the time (table III). Men of economically active age (15 to 64 years) were at highest risk. Around one in 10 of the victims was under 15 years old, the highest proportion of children being in Afghanistan because of their employment as herders. Few of the blasts in Afghanistan, Bosnia, and Cambodia affected women, but in Mozambique about a quarter of the victims were women.

In Bosnia each blast killed an average of 0.54 people

TABLE III—Age and sex specific rates of land mine accidents. Values are numbers of events per 1000 population

	Age (years)		
	≤ 14	15-44	≥ 45
Afghanistan*:			
Male	9.0	95.4	37.1
Female	8.0	4.5	18.1
Bosnia†:			
Male	0.7	8.1	2.3
Female	0.0	0.0	0.5
Cambodia:			
Male	4.0	51.3	29.4
Female	0.4	2.3	3.7
Mozambique:			
Male	1.4	14.3	10.6
Female	1.0	3.2	5.6

*In only certain provinces.

†May be underestimates because some incidents were viewed as being of military importance.

TABLE IV—Risk of injury after moving land mines. Values are numbers of subjects

	Afghanistan			Bosnia	Cambodia	Mozambique
	Residents	Refugees	Nomads			
Those injured by mines:						
Who removed mines	191	1	52	12	63	14
Who did not remove mines	266	165	217	131	402	176
Those not injured by mines:						
Who removed mines	47	0	14	8	29	14
Who did not remove mines	4372	1864	1149	1125	5594	8955
Odds ratio*	4	—	1.43	5.9	6.25	50
χ^2 , df=1	74	0.1	1.32	18	85	317

*Combined odds ratio 4.2 (95% confidence interval 3.6 to 5.6), $\chi^2=189.6$.

TABLE V—Extent of land mine injury. Values are numbers (percentages) of victims*

	Afghanistan (n=1265)	Bosnia (n=135)†	Cambodia (n=443)	Mozambique (n=176)†
No injury	80 (6)	2 (1.5)	14 (3)	3 (2)
Death	699 (55)	54 (40)	139 (31)	74 (42)
Loss of:				
Arm	90 (7)	24 (17)	27 (6)	18 (11)
Leg	153 (12)	34 (25)	172 (39)	47 (27)
Foot, toes, fingers	142 (13)	6 (4)	97 (22)	18 (10)
Multiple fragments in body	109 (8)	12 (9)	94 (21)	4 (8)
Blindness	63 (5)	3 (2.2)	21 (5)	2 (1)
Head injury	19 (1.5)		23 (5)	

*Some victims had several injuries.

†Details not available for all cases.

TABLE VI—Details of surgery, admission, and costs of treatment in victims of land mine accidents. Values are numbers (percentages) of subjects unless stated otherwise

	Afghanistan		Bosnia (n=99)	Cambodia (n=304)	Mozambique (n=174)
	Residents (n=383)	Nomads (n=107)			
No of operations:					
0	14 (3.7)	1 (1)	58 (58)	48 (16)	100 (57)
1	126 (33)	30 (28)	33 (33)	165 (54)	44 (25)
2	119 (31)	44 (41)	34 (34)	66 (22)	12 (7)
≥ 3	123 (32)	32 (30)	9 (9)	25 (8)	18 (10)
Mean (SD) of No of operations	2.3 (1.95)	2.7 (2.9)	1.1 (1.4)	1.3 (1.1)	0.93 (0.9)
Admission	377 (98)	104 (97)	77 (77)		88 (50)
Mean (SD) days in hospital	120.4 (131)	114.8 (146)	55 (86)		67 (102)
Costs:					
To pay	381 (99)	104 (97)	21 (21)	223 (73)	43 (25)
Had to sell goods to pay	217 (57)	64 (60)	17 (17)	92 (30)	41 (24)

and injured 1.42; in Mozambique each blast killed an average of 1.45 people and wounded 1.27. Roughly the same percentage of blasts (40%) was associated with death in each country. Walking—to the fields and between or around villages—was one of the highest risk activities in Mozambique, Cambodia, and Afghanistan. Herding was the highest risk activity for Afghan nomads. In the most recent fighting in Bosnia over half of the episodes were related to military activity, mostly affecting soldiers on patrol duty.

Land mine incidents have increased sharply over the past 15 years, even when the latest fighting in Bosnia is excluded. When the first four years of the 1990s were compared with the first four years of the 1980s, the incidence has more than doubled. There were 195 cases in the Afghan, Cambodian, and Mozambique samples from 1980 to 1983 and 610 from 1990 to 1993.

In Afghanistan one resident or nomad household in 20 tried to remove land mines (304/6616); in Bosnia around 2% of households (20/1256); in Cambodia around 2% (92/5996); and in Mozambique only 0.3% (28/9131). A household in which members had tried to move mines had four times the risk of having a victim—usually not the person who tampered with the mine (odds ratio 4.2 (3.6 to 5.6) $\chi^2=189.6$). The stratified risk difference, the proportion of cases that could theoretically be avoided among households that tamper with mines, is around 19.4% (16.6% to 22.1%) (table IV).

DISABILITIES AND THEIR COSTS

The commonest injury among survivors of land mine incidents is loss of a leg, as would be expected from antipersonnel devices (table V). Many victims had to undergo multiple operations for their injuries (table VI). More than half of all victims were admitted, each spending an average of two months in hospital. In Cambodia 61% (184/302) of victims went into debt to pay for their medical attention; in Afghanistan the proportions were 84% (317/376) among residents and refugees and 87% (91/105) among nomads. Between 12% and 60% had to sell assets to meet their medical bills.

Injuries affected victims' families and work (table VII). The commonest complaint across the four countries was of reduced productivity. Family relationships were affected for around one in every four victims; relationships with colleagues were affected for about 45%.

FOCUS GROUPS

Clear messages emerged from some of the focus groups. In Afghanistan the groups concluded that the most appropriate channels for increasing the awareness about land mines were the radio, especially the BBC (22 groups); community meetings (20 groups); schools (15 groups); and mosques (9 groups). In Cambodia community meetings and interpersonal communication were identified as the best channels. Ideas for employment opportunities among those disabled by land mines were animal husbandry in Cambodia and workshops and artisan cooperatives in Mozambique.

Discussion

War still continues in two of the countries we studied. While fieldwork was in progress in Cambodia the Khmer Rouge launched a new offensive. In eastern Bosnia one of our teams was imprisoned for three days while the community they were surveying was "ethnically cleansed." Throughout Bosnia-Herzegovina there was active fighting, sniper attacks, mortar bombings, and changing borders. Under these conditions, information related to war casualties took on military importance. As a result, some hospital staff, aid

TABLE VII—Social consequences of land mining accidents. Values are numbers (percentages) of subjects

	Afghanistan				
	Residents (n=383)	Nomads (n=107)	Bosnia (n=136)	Cambodia (n=304)	Mozambique (n=174)
Main effect					
None	80 (21)	35 (33)	69 (51)	28 (9)	125 (72)
Reduced productivity	118 (31)	24 (22)	25 (18)	193 (63)	17 (10)
Mental health/dependency	47 (12)	28 (26)	32 (24)	47 (15)	2 (1)
Health				22 (7)	18 (10)
Relationships with family					
No effect	182 (48)	67 (63)	103 (76)	118 (39)	153 (88)
Desertion			5 (4)	5 (2)	4 (2)
Rejection cannot satisfy	167 (44)	20 (19)	5 (4)	105 (35)	3 (2)
Depression/dependent	14 (4)	3 (3)	16 (12)	64 (21)	9 (5)
Relationships with colleagues					
No effect	189 (49)	66 (62)	97 (71)	97 (32)	155 (89)
Loneliness	36 (9)	2 (2)	12 (9)	102 (34)	10 (6)
Depressed/embarrassed	83 (22)	11 (10)	20 (15)	76 (25)	3 (2)
Improved			5 (4)		
Rejection/lost respect	92 (24)	8 (7)		73 (24)	4 (2)

workers, and individual informants refused to participate.

Even allowing for possible overestimation by affected communities, this study confirms a substantial toll in physical, mental, and economic disability resulting from the widespread use of land mines. This cost falls to communities already burdened by poverty and disease who, in economies fractured by war, have to reconstruct their home lives and countries.

Programmes to increase awareness about mines are being widely undertaken in affected communities.^{19 20} Accurate recent local data about the number of mine incidents and their risk factors can be an important contribution to and focus for such programmes. In all four countries mines are sold as scrap metal and in at least two of them freelance mine layers can be hired to put mines near the home of a personal enemy. The fourfold excess risk of a mining accident in households in which someone had tried to remove mines could form the basis of an awareness programme. If no indirect association accounts for this finding, stopping this practice could reduce a person's risk of injury from mines to a quarter. This could make a compelling educational message.

Key messages

- Between 25% and 87% of households had daily activities affected by land mines
- One household in 20 reported a land mine victim, a third of them dying in the blast; one in 10 of the 2100 victims was a child
- The incidence of land mine accidents has more than doubled between 1980-3 and 1990-3, excluding the recent war in Bosnia
- Without mines, agricultural production could increase by 88-200% in Afghanistan, 11% in Bosnia, 135% in Cambodia, and 3.6% nationally in Mozambique
- A total of 54 554 animals were lost due to land mines, with a minimum cash value of nearly \$200 per household
- Households with a land mine victim were 40% more likely to have difficulty providing food for the family
- Family relationships were affected for one in every four victims

But efforts to reduce the social costs of land mines can be, at best, a holding strategy; they will soon be overtaken by the continued and increased deployment of antipersonnel land mines. Only a total ban on the manufacture, export, and use of these weapons can really help. Even if this happens, the World Health Organisation estimates that at the present rate of clearance it will take 1100 years to remove all the existing land mines threatening thousands of communities across the world.⁹

CIETinternational stands for Community Information and Epidemiological Technologies; it is a non-profit non-governmental organisation promoting community based research.

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