

# The underreporting of landmine and explosive remnants of war injuries in Cambodia, the Lao People's Democratic Republic and Viet Nam

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Injuries place an enormous burden on individuals, households, and communities and they exacerbate poverty.<sup>1</sup> A substantial but often under-recognized cause of injury in post-conflict environments is the presence of landmines and explosive remnants of war (ERW), such as abandoned ordnance or weapons and cluster munitions, bombs, mortars or other devices that failed to detonate on impact but remain volatile and can explode if touched or moved. This under-recognition, which is partly the result of underestimates, has global implications because it affects to what extent the resources assigned to injury prevention and the rehabilitation of injured people are prioritized.

This paper provides detailed case studies of three countries that are heavily contaminated with landmines and ERWs and where mine action programmes – i.e. programmes for humanitarian, non-military purposes – have been in place for a long time: Cambodia, the Lao People's Democratic Republic (PDR) and Viet Nam. The purpose is to illustrate the degree to which injuries caused by landmines and ERW are underreported. The paper highlights how little has been published in the health literature on the subject of landmines and ERW and the failure to include available national data on the injuries caused by these devices in global burden of disease (GBD) estimates. The GBD is a measure that combines the contribution of both mortality and impaired functionality resulting from a range of diseases and injuries to provide a national ranking for comparing disease burdens across countries and, by implication, for assessing the relative importance of a given health problem at the national and global levels. Hence, underreporting is of global relevance.

The underutilization of available national data on injury from landmines

and ERW has probably affected the national burden of disease estimates for 2004 and 2008 and perhaps the regional and global estimates in the 2010 GBD study conducted by the World Health Organization (WHO). In this paper we examine the reasons for this underutilization of in-country data and provide recommendations of relevance to the global context. The paper proposes that the revisions to the tenth revision of the International Classification of Diseases (ICD-10) and to GBD figures, that are under way, provide opportunities to generate more accurate estimates and to better capture the current burden of injury from landmines and ERW.

## Global burden of disease, 2004 and 2008

Studies conducted in 2004 and 2008 provided country-specific burden-of-disease profiles. The GBD estimates presented in this paper were derived from these profiles. In calculations for the 2004 and 2008 GBD studies, the number of deaths and the burden of disease (expressed in terms of disability-adjusted life years [DALYs]) resulting from landmine and ERW injuries were calculated with reference to ICD-10 codes Y36, which cover all forms of death and disability sustained during operations of war and peacekeeping missions.<sup>2</sup> For example, Y36.2 covers “war operations involving other explosions and fragments”; Y36.8 covers “war operations occurring after cessation of hostilities”, which account for most of the death and disability from landmine and ERW injuries in the Lao People's Democratic Republic, Cambodia and Viet Nam.<sup>3</sup>

GBD estimates for 2004 and 2008 do not reflect the cumulative burden of disease and death attributable to land-

mines and ERW injuries over the past 37 years. Estimates of deaths from injuries coded in the ICD-10 as Y36 are much lower in GBD studies than estimates obtained from in-country mine action landmine and ERW injury data collection systems for 2004 and 2008 (Table 1). Despite the availability of mine action data in the Lao People's Democratic Republic, Cambodia and Viet Nam, GBD studies relied on cause-of-death models fed by data from countries not included in this study, reflected in the level 4 quality of estimate for these GBD studies. In GBD studies, a level 4 rating indicates that country-specific information for adults was missing or only partly available and hence cause-of-death models were used.<sup>2</sup> The evidence from which the disability component of the DALY was estimated was also rated as level 4, which again suggests that country-specific information on the incidence or prevalence of disability from landmine and ERW injuries was incomplete.<sup>2</sup>

## Published literature

The points made earlier were confirmed by the results of a literature search. In March and April 2012, we searched Web of Knowledge, Scopus and PubMed for studies published from 1990 to 2011 on the prevalence of civilian injuries from landmines and ERW in our three countries of interest (Box 1). The search yielded six studies for the final analysis. We used the Grading of Recommendation, Assessment, Development and Evaluation (GRADE) approach to assess the methodological quality of the six studies, of which none was able to estimate national incidence or prevalence. The only study from the Lao People's Democratic Republic, a retrospective cross-sectional survey conducted in a single province, reported 870 civilian injuries between 1975 and 1996.<sup>4</sup> Of

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five studies conducted in Cambodia, four relied on hospital-based data and were thus subject to access bias.<sup>5–8</sup> The remaining study, a district-level, retrospective cross-sectional survey ( $n = 6090$ ), showed that 7% ( $n = 432$ ) of the local households had been affected by landmine injuries. These had been fatal in 31% ( $n = 136$ ) of the cases.<sup>9</sup> Our search yielded no studies for Viet Nam. A study of childhood injury conducted by the United Nations Children's Fund (UNICEF) did not identify any injuries resulting from landmines or ERW.<sup>1</sup> By contrast, a household survey in Quang Tri Province estimated that 1.2% of the provincial population had been injured by landmines and ERW between 1975 and 2010.<sup>10</sup>

## Mine action information management systems

After armed conflict, countries usually establish mine action programmes to manage and coordinate problems related to landmine and ERW contamination. Globally, these programmes are guided by the International Mine Action Standards and typically use a database known as the Information Management System for Mine Action (IMSMA). This database records information on hazardous areas, areas cleared and injuries. Originally developed by the Swiss Federal Institute for Technology in 1998, it has been further developed by the Geneva International Centre for Humanitarian Demining. This database is usually maintained by national mine action authorities but is not linked to national health information systems or designed to be compatible with them.

Of the three countries examined in this paper, Cambodia has the most developed data collection system. Cambodian Red Cross volunteer focal points at the district level notify mine action authorities when someone has been injured by a landmine or ERW and casualties are entered into the IMSMA by the mine action authorities. The health information system, on the other hand, collects hospital-based data. Cambodian mine action authorities have reported 63 815 casualties resulting from landmines and ERW since 1979.<sup>3</sup> The Lao People's Democratic Republic has a community-based data collection system for injuries from ERW, but the

Table 1. Deaths according to global burden of disease (GBD) studies versus deaths as recorded by country mine action (MA) authorities, 2004 and 2008

Country	2004		2008	
	MA <sup>a</sup>	GBD <sup>b</sup>	MA <sup>a</sup>	GBD <sup>b</sup>
Cambodia	171	127	47	67
Lao People's Democratic Republic	117	60	99	0
Viet Nam	89	30	36	0

<sup>a</sup> Deaths from injuries caused by landmines and explosive remnants of war.

<sup>b</sup> Deaths from injuries coded as Y36 in the International Classification of Diseases, tenth revision.

### Box 1. Strategy used to search for studies on civilian injuries from landmines and explosive remnants of war in three Asian countries<sup>a</sup>

1. *Lao People's Democratic Republic OR Viet Nam OR Cambodia AND explosive remnants of war OR landmines OR unexploded ordnance OR bombs OR mines*

2. *burden OR impact OR mortality OR disability OR injury or cost*

Combined terms: 1 AND 2.

<sup>a</sup> Limited to 1990–2011. The databases searched were Web of Knowledge, Scopus and PubMed.

system is not operational in all contaminated provinces and it is not linked to health information systems.<sup>3</sup> In a recent national retrospective household survey (1974 to the end of 2007), the mine action authority of the Lao People's Democratic Republic identified 20 008 civilian casualties between the ages of 15 and 35 years.<sup>11</sup> Viet Nam lacks a nationwide surveillance or reporting system, but the national mine action authority has reported 104 701 injuries from landmines and ERW, many among civilians (65 852 injured; 38 849 killed), between 1975 and 2007.<sup>3</sup>

Although the mine action authority is typically the best source of estimates of the number of injuries from landmines and ERW, the IMSMA is less comprehensive than the injury databases in some developed countries. The IMSMA generally includes information on the nature of the injury, whether it was fatal or non-fatal, the location of the incident, the device involved and the activity in which the person was engaged when injured. ICD-10 codes are not used in the IMSMA. For example, in the Lao People's Democratic Republic, 294 incidents were recorded in 2004. Of these, 47 occurred because the heat of a fire triggered the explosion of subsurface ERW. The cause of injury was coded as being fire in the IMSMA database.<sup>11</sup> The quality of the data in the IMSMA is thus influenced by some of the same factors that affect data quality in other low-income and lower-middle-income countries, namely, inadequate vital registration; lack of standardized case

definitions and lack of integration of injury-related trauma into surveillance systems or health surveys. In countries such as the United States of America, for example, data are obtained from a variety of sources, including coroners and medical examiners, vital record registries and the police, and they are linked to a standardized national database.

Injuries vary in severity. This makes accurate coding problematic in systems that have been designed predominantly for the recording of a single diagnosis or cause of injury. The current practice of reporting injuries as fatal or non-fatal fails to capture the total burden of disease.<sup>1</sup> Those who survive landmine and ERW explosions can suffer countless forms of injury, including multiple traumatic amputations of limbs, burns, puncture wounds and lacerations, ruptured eardrums and blindness, to name a few.<sup>4,5,7–9</sup> Patients who are seriously injured by landmines or ERW typically remain in the hospital longer, require more blood transfusions and undergo more operations than those who suffer injuries from other causes.<sup>9</sup> Survivors often experience chronic pain, social exclusion and high levels of psychological distress, all of which are risk factors for poor mental health and increased drinking and smoking and can heighten susceptibility to non-communicable diseases. Associated household out-of-pocket health expenditure can represent a catastrophic financial burden resulting in impoverishment, malnutrition and disease.<sup>6,9</sup>

## Conclusion

This paper has highlighted discrepancies between in-country data on injuries caused by landmines and ERW, the published literature and the 2004 and 2008 national estimates of GBD in three countries of south-eastern Asia. The underutilization of national data has undermined the accuracy of national burden of injury estimates for 2004 and 2008 and perhaps that of 2010 regional and global GBD estimates. This can, in turn, affect resource allocation and planning.

Mine action reporting systems must be strengthened. They must be coordinated with national health systems through measures such as linking the

IMSMA to health information systems. Leadership and global engagement are needed to mobilize intersectoral action and promote an integrated response to the needs of survivors. The increased attention being paid to injuries in developing countries and the revisions to the ICD-10 that are under way in preparation for the ICD-11 offer the chance to amend inconsistencies in the coding of injuries. In addition, revising the methods used in GBD studies so that input from developing world researchers is also used to generate the estimates can provide an opportunity for global engagement. The United Nations Mine Action Service, the United Nations agency responsible for mine action and for the International Mine

Action Standards, needs to collaborate with other United Nations agencies that are also involved in mine action to leverage opportunities to ensure appropriate recognition of the burden of injury from landmines and ERW. This includes WHO, which is the United Nations focal point for action surrounding the survivors of injuries from landmines and ERW, and UNICEF, the United Nations focal point for mine risk education. Without such action, these injuries will continue to remain invisible in burden-of-disease estimates and their survivors, who are already marginalized, will continue to be underserved. ■

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