Each year landmines kill and maim an estimated 26 000 people worldwide.1 About 10%–40% of these victims are children, most of whom are affected long after the cessation of hostilities.2 3 These deaths and injuries are potentially preventable but planning measures are hampered by the lack of data on determinants of landmine injuries in children; consequently mine awareness programmes for children are routinely designed using adult data.4 To overcome this gap, we have studied the determinants of landmine related injuries in Bosnia and Herzegovina during 1991–2000, and compared children with adults.

SUBJECTS, METHODS, AND RESULTS
Since 1996, the International Committee of the Red Cross (ICRC) and the Red Cross Society of Bosnia-Hercegovina have maintained an active surveillance system for collecting data on mine related injuries.4 Red Cross field workers based in each municipality (n=128) actively seek out any reports of mine related incidents through local information, hospitals, and organisations involved in such activities. Each report is followed up by a personal visit to the victim’s household by the field worker who then completes a standardised questionnaire. These questionnaires are returned monthly and entered on the ICRC database in Sarajevo. The database is validated by reports from other sources involved in mine related activities. Data for post-war years (1996–2000) were collected prospectively and are complete while that from the war years (1991–95) are retrospective data likely to be incomplete in coverage. It is impossible to validate data from the time of conflict.

From this database, we retrieved data on determinants of landmine injuries for all the victims of landmines during the period 1991–2000. Data retrieved were broadly under the categories of demographic data, knowledge and background of the victim, nature of the device, timing and activity at the time of the injury, and outcome of the incident. Data on all the determinants were used as such except one relating to activity at the time of incident, which was categorised into three groups on the basis of potential for modification by mine awareness activities: (a) preventable (modifiable)—leisure and handling device out of curiosity; (b) partially preventable (partially modifiable)—economic, returnee, and mobility activity; and (c) non-preventable (limited potential for modification)—de-mining and military/police activity. We analysed the data by carrying out simple comparisons of proportion of children and adults affected for each of the determinants; children were defined as those under the age of

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Determinants of landmine related injuries in Bosnia and Herzegovina 1991–2000: children compared with adults</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Nature of the population</td>
<td></td>
</tr>
<tr>
<td>Male sex</td>
<td></td>
</tr>
<tr>
<td>Returnees</td>
<td></td>
</tr>
<tr>
<td>Nature of the device</td>
<td></td>
</tr>
<tr>
<td>Device type IED/UXO</td>
<td></td>
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<tr>
<td>Outcome of the incident</td>
<td></td>
</tr>
<tr>
<td>(a) Dead</td>
<td></td>
</tr>
<tr>
<td>(b) Amputations</td>
<td></td>
</tr>
<tr>
<td>(c) Eye injuries</td>
<td></td>
</tr>
<tr>
<td>(d) Fragment injuries</td>
<td></td>
</tr>
<tr>
<td>Timing of the incident</td>
<td></td>
</tr>
<tr>
<td>Spring season (March–April)</td>
<td></td>
</tr>
<tr>
<td>Weekend (Fri–Sun)</td>
<td></td>
</tr>
<tr>
<td>Knowledge and behaviour of victims</td>
<td></td>
</tr>
<tr>
<td>First visit to site</td>
<td></td>
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<tr>
<td>Knew that site was mined</td>
<td></td>
</tr>
<tr>
<td>Incident considered†</td>
<td></td>
</tr>
<tr>
<td>(a) Preventable</td>
<td></td>
</tr>
<tr>
<td>(b) Partially preventable</td>
<td></td>
</tr>
<tr>
<td>(c) Non-preventable</td>
<td></td>
</tr>
<tr>
<td>Others involved in the same incident</td>
<td></td>
</tr>
<tr>
<td>(a) Injured (yes)</td>
<td></td>
</tr>
<tr>
<td>(b) Killed (yes)</td>
<td></td>
</tr>
</tbody>
</table>

*UXO, unexploded ordnance; IED, improvised explosive device. †Based on the nature of activity’s potential for modification by mine awareness activities, incidents were classified as: (a) preventable (activity modifiable): leisure activities (swimming, playing, recreation), and handling device out of curiosity; (b) partially preventable (activity partially modifiable): economic activity (farming, tending livestock), returnee activity (returning home, reconstruction), and mobility (travelling, walking, driving); (c) non-preventable (limited potential for activity modification): de-mining and military/police activity.
18 years. Statistical significance for these comparisons was
tested by $\chi^2$ tests using the statistical package Stata version
6.0.

There were 4064 victims of mine related injuries reported to
the ICRC overall (1991–2000), of which 549 (14%) were chil-
dren. Children were more likely to be injured during
peace-time as compared with adults (children: 50%, adults:
26%; $p<0.001$), see figure 1. Greater predisposition for male
sex and spring season were determinants common to both
adults and children; however, children differed significantly
from adults in their knowledge of the nature of the device and
the site being mined, and in the incident being considered
“preventable”. By far the commonest activity for children at
the time of incident was recreational (44%), unlike adults who
were involved in military/police activities (48%). Children are
also more likely to be killed or injured in groups than adults
(table 1).

COMMENT
This study highlights important differences between children
and adults in the determinants of landmine related injuries,
including a large modifiable behavioural component. Marking
of mined areas, information, and mine awareness need to
begin very early in the peace-time when sudden freedom of
movement results in a large number of injuries. Preventive
programmes need to be tailored appropriately for children
with greater emphasis on knowledge of non-classic explosive
devices. Such programmes also need to be more active in early
springtime possibly targeting boys more than girls. Clearly
identified safe play areas and addressing group behaviour are
important as most incidents in children follow recreational
activities in groups.

Anti-personnel landmine associated mortality and morbidi-
ty in children remains one of the unmet challenges of
preventative medicine despite significant potential for saving
years of life lost and disability. A total ban on landmines is
welcome; however, at the present rate it would still take a long
time to clear the existing landmines today. Greater commit-
tment and resources from the international community are
required to expedite this important public health measure. In
the meantime, there is an urgent need for effective and multi-
faceted public health strategies, covering elements of mine
awareness, education, and health services, to safeguard
children living with mines. Above all, these strategies will
need to be focused by using accurate and recent local data to
make best use of limited resources.

ACKNOWLEDGEMENT
We are grateful to The International Committee for the Red Cross
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However, the views expressed in this paper are of the authors alone
and do not necessarily reflect the views of their respective
organisations or ICRC.

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Figure 1 Landmine related injuries
in Bosnia and Herzegovina