

# Flying bullets and speeding cars: analysis of child injury deaths in the Palestinian Territory

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القذائف الطائرة والسيارات المسرعة: تحليل حول الإصابات القاتلة للأطفال في الأرض الفلسطينية المحتلة

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**الخلاصة:** على الرغم من أن الأطفال يمثلون بالفعل نصف عدد السكان الفلسطينيين إلا أنه لا يولي أدنى اهتمام بمشكلة الإصابات التي يتعرض لها الطفل. وقد أجري القاتمان على هذه الدراسة فحصاً لأنماط الإصابات المميتة في الأطفال ممن تتراوح أعمارهم بين صفر و19 عاماً في كل من الضفة الغربية وقطاع غزة (الأرض الفلسطينية المحتلة)، ومقارنة نفس المعطيات بأطفال إسرائيل ومقاطعتي إنكلترا وويلز في بريطانيا. وقد استعان الدارسون بشهادات الوفاة في تجميع المعطيات للفترة من 2001 وحتى 2003، وتم تقدير معدلات الوفيات السنوية لكل مئة ألف طفل. وقد أظهرت الدراسة أن السبب الرئيسي وراء الإصابات المميتة للأطفال الفلسطينيين كان الصواريخ الحربية (9.6)، مقارنة بحوادث الطرق بالنسبة لأطفال كل من إسرائيل (5.0) ومقاطعتي إنكلترا وويلز (3.5) على التوالي.

**ABSTRACT** Despite the fact that children account for over half the Palestinian population, little attention has been paid to the problem of child injuries. We examined the types of injury mortality in children aged 0–19 years in the West Bank and Gaza Strip (Palestinian Territory) and compared these with similar data for children in Israel and England and Wales. We used data from death certificates covering 2001–2003. Death rates per 100 000 children per year were estimated. The leading cause of injury mortality in Palestinian children was accidents caused by firearms missiles (9.6). In comparison, transport accidents were the leading cause of death in children in both Israel (5.0) and England and Wales (3.5).

## Tirs de balles et vitesse des voitures : analyse de la mortalité infantile liée aux traumatismes dans le territoire palestinien

**RÉSUMÉ** Bien que plus de la moitié de la population palestinienne soit composée d'enfants, le problème des traumatismes chez l'enfant bénéficie de peu d'attention. Nous avons examiné les types de traumatismes mortels chez les enfants âgés de 0 à 19 ans en Cisjordanie et dans la bande de Gaza (territoire palestinien) et les avons comparés aux mêmes données concernant les enfants d'Israël, d'Angleterre et du Pays de Galles. Nous avons utilisé les données figurant sur les certificats de décès de la période 2001-2003. Les taux de mortalité pour 100 000 enfants par an ont été estimés. La mortalité liée aux traumatismes chez les enfants palestiniens avait pour principale cause les accidents provoqués par les projectiles d'armes à feu (9,6). Par comparaison, les accidents de transport étaient la principale cause de décès chez les enfants en Israël (5,0) ainsi qu'en Angleterre et au Pays de Galles (3,5).

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## Introduction

Worldwide, injuries are the leading cause of death among children after their first birthday [1]. The relative importance of the problem varies according to the age and sex of the child. It also varies by geographical location and socioeconomic status. The World Health Organization (WHO) estimates that over 800 000 children under the age of 15 years were killed by injuries in 2002 [2]. It is thought that war and road traffic injuries are among the 10 leading causes of death for children aged 0–4 years living in the low and middle income countries of the WHO Eastern Mediterranean Region [3]. Likewise, injuries from road traffic, drowning, war, interpersonal violence, falls, fires and poisoning are among the 10 leading causes of death among children in the age group 5–19 years in that area [3].

It is believed that injuries are the leading cause of death among children in the Palestinian territory. They account for 23% and 52% of the total deaths among children aged 1–4 years and 5–19 years respectively [4]. Despite the fact that children aged 0–19 years account for over half (53%) the Palestinian population [5], little attention has been paid to the problem of child injuries. The published literature is limited to the intifada-related injuries [6,7].

This study aims to identify the types of injury that lead to death among Palestinian children aged 0–19 years. We also investigated whether the causes of injury mortality were different among children in Israel and the United Kingdom (UK). Our intention in analysing these data was so that our findings could enlighten Palestinian health policy makers about the magnitude of the child injury mortality problem, and to help them consider appropriate intervention policies to either limit or prevent the occurrence of injury among Palestinian children aged 0–19 years.

## Methods

We obtained data on all deaths from injury in children aged 0–19 years between 2001 and 2003 in the Palestinian Territory from the Palestinian Health Information Centre, Ministry of Health, located in the Gaza Strip. Deaths were reported from each of the West Bank and Gaza Strip separately and were then compiled in a single database at the Palestinian Health Information Centre. For comparison, child deaths from injury in Israel were obtained from Israel's Central Bureau of Statistics, and child deaths from injury in England and Wales were provided by the Office for National Statistics, UK. Each data set included age, sex, external cause of injury and year of death. External causes of injury were defined according to the International Classification of Diseases, Tenth Revision (ICD-10).

Our attempts at contact with other Arab countries, such as Jordan, were unsuccessful in obtaining injury mortality data for comparative purposes. Data from England and Wales were therefore used owing to their availability. However, the interpretation of the current results should take into account the use of data from England and Wales, which might introduce different causes of injury from those shown in the Palestinian data due to cultural and structural differences. When literature investigating the occurrence of injury in the Eastern Mediterranean countries and Israel were systematically reviewed, most articles were found to investigate injury morbidity. Those that studied injury mortality were either not broken down to the age groups of the population under investigation, or they investigated injury mortality in a different period than that used in our study (2001–2003), and used a different revision of ICD (E800–E999) [8,9]. However, in other articles investigating injury occurrences in the Gulf countries, comparisons

with England and Wales were found to have been made [10,11].

We used published census data to calculate death rates from injury per 100 000 population. Assuming no change in the age distribution over the 3 years, the estimated population of the middle year (2002) was used to calculate the overall and specific injury mortality rates in the West Bank and Gaza Strip, while in Israel and England and Wales, we used the estimated population for the year 2001. The annual rates were estimated by dividing the specific injury mortality rates by 3. *Stata*, version 9.2, was used to estimate death rates with 95% confidence intervals. To compare age-specific mortality rates in the 3 countries, we standardized for age using a combination of the 3 populations as our standard population.

## Results

The overall annual injury mortality rate in Palestinian children (18.1/100 000 children) was almost twice that in Israel (10.0/100 000 children) and more than 3 times that in Eng-

land and Wales (5.2/100 000 children) (Table 1). In all 3 countries, the overall annual injury mortality rate was higher among boys than girls. Overall annual injury mortality rates were highest among children aged 15–19 years in all 3 populations (Table 1).

In each country, the leading causes of injury death varied according to age. The most common cause among Palestinian children aged 15–19 years was accidents caused by firearms missiles with annual mortality rate of 34.6 (95% CI: 31.2–38.3) deaths per 100 000 children, followed by transport accidents with annual mortality rate of 2.2 (95% CI: 1.4–3.3) deaths per 100 000 children (Table 2). The most common cause among Palestinian children aged 10–14 years was accidents caused by firearms missiles, followed by transport accidents. The leading causes among those aged 5–9 years were transport accidents, accidents caused by firearms missiles and falls, and for children aged 0–4 years the leading causes of injury death were transport accidents, accidental drowning and submersion, and falls (Table 2).

**Table 1 Injury mortality rates in children aged 0–19 years in the Palestinian Territory, Israel and England and Wales for the period 2001–03**

Characteristic	Palestinian Territory		Israel		England and Wales	
	No. <sup>a</sup>	Rate <sup>b</sup> (95% CI)	No. <sup>a</sup>	Rate <sup>b</sup> (95% CI)	No. <sup>a</sup>	Rate <sup>b</sup> (95% CI)
<i>Sex</i>						
Female	214	7.5 (6.5–8.6)	208	6.0 (5.2–6.8)	540	2.8 (2.6–3.1)
Male	846	28.1(26.2–30.1)	507	13.8 (12.6–15.0)	1535	7.6 (7.3–8.1)
<i>Age (years)</i>						
0–4	246	14.0 (12.0–16.0)	100	5.0 (4.1–6.1)	439	4.7 (4.3–5.2)
5–9	168	10.0 (9.0–12.0)	70	3.9 (3.0–4.9)	206	2.1 (1.8–2.4)
10–14	175	13.0 (11.0–15.0)	83	4.9 (3.9–6.0)	362	3.5 (3.2–3.9)
15–19	471	41.0 (37.0–45.0)	462	27.7 (25.2–30.3)	1045	10.8 (10.2–11.5)
<i>Total</i>	1060	18.1 <sup>c</sup> (17.0–19.2)	715	10.0 <sup>c</sup> (9.3–10.7)	2052	5.2 <sup>c</sup> (5.0–5.5)

<sup>a</sup>Number of children who died from injury.

<sup>b</sup>Per 100 000 children per year.

<sup>c</sup>No differences were detected between the overall age-specific injury mortality rate and the age-adjusted mortality rate.

CI = confidence interval.

**Table 2 The 5 leading causes of injury deaths among children aged 0–19 years in the Palestinian Territory, Israel and England and Wales for the period 2001–03: distribution according to age**

Cause (ICD-10 code)	0–4 years		5–9 years		10–14 years		15–19 years		Total	
	No.	Rate <sup>a</sup> (95% CI)	No.	Rate <sup>a</sup> (95% CI)	No.	Rate <sup>a</sup> (95% CI)	No.	Rate <sup>a</sup> (95% CI)	No.	Rate <sup>a</sup> (95% CI)
<i>Palestinian territory</i>										
Firearms missiles (W32–W34)	26	1.4 (0.9–2.0)	51	3.2 (2.4–4.2)	112	8.3 (6.8–10.0)	377	34.6 (31.2–38.3)	566	3.2 (3.0–3.4)
Transport accidents (V01–V99)	102	5.4 (4.4–6.5)	75	4.7 (3.7–5.8)	28	2.1 (1.4–3.0)	24	2.2 (1.4–3.3)	229	1.3 (1.0–1.4)
Accidental drowning & submersion (W65–W74)	50	2.7 (5.9–10.5)	13	0.8 (0.4–1.4)	10	0.7 (0.4–1.4)	17	1.6 (0.9–2.5)	90	0.5 (4.3–0.7)
Falls (W00–W19)	40	2.1 (1.5–2.9)	18	1.1 (0.7–1.8)	7	0.5 (0.21–1.1)	3	0.3 (0.1–0.8)	68	0.4 (0.3–0.5)
Assault (X85–Y09)	3	0.2 (0.03–0.5)	3	0.2 (0.03–0.6)	2	0.2 (0.01–0.5)	19	1.7 (1.0–2.6)	27	0.2 (0.1–0.2)
<i>Israel</i>										
Transport accidents (V01–V99)	69	3.5 (2.7–4.4)	56	3.1 (2.3–4.0)	40	2.3 (1.7–3.2)	197	11.8 (10.2–13.6)	362	1.7 (1.5–1.8)
Falls (W00–W19)	8	0.4 (0.17–0.8)	0	–	3	0.2 (0.03–0.5)	7	0.4 (0.2–0.9)	18	0.1 (0.05–0.1)
Intentional self harm (X60–X84)	0	–	0	–	7	0.4 (0.16–0.9)	98	5.8 (4.8–7.2)	105	0.5 (0.4–0.6)
Accidental drowning and submersion (W65–W74)	10	0.5 (0.24–0.93)	7	0.4 (0.15–0.8)	8	0.5 (0.20–0.9)	14	0.8 (0.5–1.4)	39	0.2 (0.1–0.2)
Assault (X85–Y09)	11	0.6 (0.27–1.0)	3	0.2 (0.03–0.5)	2	0.1 (0.01–0.4)	43	2.6 (1.8–3.5)	59	0.3 (0.2–0.4)
<i>England &amp; Wales</i>										
Transport accidents (V01–V99)	84	0.9 (0.7–1.1)	88	0.8 (0.7–1.0)	191	1.8 (1.5–2.1)	1004	9.7 (9.1–10.3)	1374	3.5 (3.3–3.7)
Event of undetermined intent (Y10–Y34)	95	1.0 (0.8–1.2)	27	0.3 (0.2–0.4)	49	0.5 (0.3–0.6)	461	4.5 (4.1–4.9)	632	1.5 (1.4–1.7)
Intentional self harm (X60–X84)	0	–	0	–	13	0.1 (0.06–0.2)	232	2.2 (1.9–2.5)	248	0.6 (0.5–0.7)
Suffocation & exposure (W75–W99) <sup>b</sup>	103	1.1 (0.9–1.3)	6	0.1 (0.02–0.1)	45	0.4 (0.3–0.6)	53	0.5 (0.4–0.7)	207	0.5 (0.4–0.6)
Poisoning (X40–X49) <sup>c</sup>	4	<0.1 (0.01–0.1)	0	–	3	0.3 (0.01–0.08)	106	1.0 (0.8–1.2)	112	0.3 (0.2–0.3)

CI = confidence interval.

<sup>a</sup>Per 100 000 children year per.

<sup>b</sup>Accidental suffocation and exposure to unspecified man-made environmental factors.

<sup>c</sup>Accidental poisoning by, and exposure to, noxious substances.

The leading causes of injury death among Israeli children aged 15–19 years were transport accidents, intentional self harm, and assault, with annual injury rates of 11.8 (95% CI: 10.2–13.6), 5.8 (95% CI: 4.8–7.2) and 2.6 (1.8–3.5) deaths per 100 000 children respectively. Transport accidents were also the most common cause of injury deaths among Israeli children aged 10–14, 5–9 and 0–4 years (Table 2).

In England and Wales, the leading causes of injury deaths among children aged 15–19 years were transport accidents, event of undetermined intent, and intentional self harm, with annual injury rates of 9.7 (95% CI: 9.1–10.3), 4.5 (95% CI: 4.1–4.9), and 2.2 (95% CI: 1.9–2.5) deaths per 100 000 children. Transport accidents were also the most common cause of injury deaths among children aged 10–14 and 5–9 years. Among those aged 0–4 years, accidental suffocation, and exposure to unspecified man-made environmental factors were the most common cause of injury deaths (Table 2).

The overall injury mortality rate in the West Bank and Gaza Strip increased between 2001 and 2002 and then decreased somewhat between 2002 and 2003; the differences were statistically significant ( $P < 0.001$ ) (Table 3). The decrease between 2002 and 2003, however, mainly reflected the trend in the West Bank: injury mortality rates remained high in the Gaza Strip. Accidents caused by firearm missiles

contributed the greatest proportion (62.3%) to the increase in overall injury mortality rates in the Palestinian Territory in 2002 (Figure 1).

In the 0–4 years age group, the rate of death from transport accidents [5.4/100 000 children (95%CI: 10.2–13.6)] was higher in the Palestinian Territory than in the UK and Israel (Table 2). Conversely, in the 15–19 years age-group, transport accident death rates were higher in Israel and England and Wales than in the Palestinian territory. The observed differences were statistically significant ( $P < 0.001$ ).

## Discussion

Firearms missiles were the most common cause of injury death in Palestinian children aged 10–14 and 15–19 years. This is likely to be due to violence by the occupation forces. Previous studies have highlighted this and reported that children were deliberately targeted by soldiers, who directed their fire to the upper part of the body with intent to kill [6, 12, 13]. The injury mortality rate in children in the Gaza Strip was higher than in children in the West Bank, with a particularly strong peak in 2002 due mainly to injury from firearms missiles. The difference could be a consequence of the extensive violence imposed by the occupation on children living in Gaza [14].

**Table 3 Trend in injury mortality rates in children aged 0–19 years in the Gaza Strip and West Bank for the period 2001–03**

Location	2001		2002		2003	
	Rate <sup>a</sup>	95% CI	Rate <sup>a</sup>	95% CI	Rate <sup>a</sup>	95% CI
West Bank	10.4	1.7–2.1	16.4	2.2–2.4	11.3	1.8–2.0
Gaza Strip	19.0	3.0–3.5	28.4	3.7–4.0	28.7	3.5–3.9

<sup>a</sup>Per 100 000 children.

CI = confidence interval.

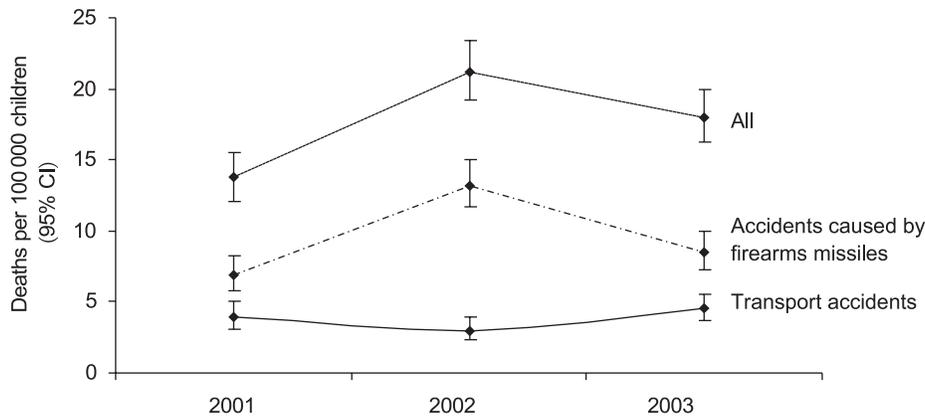


Figure 1 Trends in injury mortality rates in children aged 0–19 years in the Palestinian Territory by firearm missiles and transport accidents for the period 2001–03

Crowding and low socioeconomic status could be other risk factors for this increase. The Gaza Strip is one of the most densely populated areas in the world. It has a population density of 9000 persons per square mile [15], and has a high unemployment rate, estimated at 39.9% in 2002 [16].

One particular strength of this study is the use of mortality data, which may be more reliable than morbidity data, which suffer from under-reporting if reliant on medical records, because not all injured children will seek medical care [17]. On the other hand, under-reporting of cause of injury is common in Palestinian death certificates, particularly for intentional injuries [17]. Nevertheless, this is unlikely to change our conclusions substantially. In Israel as well as in England and Wales [18], under-reporting of cause of injury death is rare for children.

Calculating the incidence of injury among Palestinian children was based on the most up-to-date data, except for firearms missiles, provided by the Palestinian Health Information Centre. Unfortunately, data on

the impact of injury in Palestinian children before the intifada were not available. The current data lack information regarding social class, hence an assessment of whether social class was a confounding variable was not possible. Data on transport mortality were not complete, hence we were unable to identify specific risk groups (drivers, pedestrians, cyclists or passengers). Owing to lack of data on age-specific mortality we were unable to investigate the impact of the injury problem on premature mortality, years of potential life lost prior to age 65.

Overall injury mortality rate was much higher in the Palestinian Territories than in Israel and England and Wales. This may be partly attributable to differences in socioeconomic status, for which we have been unable to control. In all 3 communities, injury mortality was higher among boys than girls and children aged 15–19 years were the most affected. With respect to the predominance of males, similar patterns have been reported in other studies [19,20]. Our findings support other reports showing

that the injury mortality rate increases in the under 20 years age group [21,22].

Interestingly, the pattern of transport accidents in Palestinian children was markedly different from that in Israel and England and Wales. While the transport accident rate showed no or even negative association with age in Palestinian children, it showed a sharp rise in Israel and in England and Wales in children aged 15–19 years. In Palestinian camps and villages there are no real playing places and as a result young children are exposed to dangerous surroundings as they play in the streets [23].

The legal driving age in the Palestinian Territory is 16 years, but as a result of the low socioeconomic status, Palestinian adolescents have very limited access to cars. The Palestinian Central Bureau of Statistics estimated the private car ownership to be 24.4 per 1000 population [24] compared to 232.7 per 1000 population in Israel and 433.6 per 1000 population in England and Wales. Further restrictions on travelling by private car are usually imposed by the military checkpoints of the occupation [25]. These checkpoints usually exist between Palestinian cities forcing people to travel on foot or to use public transport. In an attempt to avoid military checkpoints, some Palestinians use bypass roads which makes them a target for the occupation forces [13].

## Conclusions

We have identified a particularly high injury death rate in children living in the Gaza Strip. This research provides a baseline orientation on the burden of injury mortality in children in the Palestinian Territory. It is hoped that our findings can stimulate and guide future research and interventional work focusing on this major public health problem. Intervention policies must be in-

formed by valid morbidity data, and it is recommended that injury surveillance systems be set up. In the Palestinian Territory, health issues cannot be separated from the political issues. The current crisis situation is likely to impede effective implementation of intervention policies.

In order to reduce mortality due to firearms missiles in Palestinian children, the international community needs to take practical steps to activate the peace process. Several strategies have been recommended by Aboutanos and Baker to reduce the effect of war on civilians [26]. It is believed that prevention of selling, distribution and manufacture of firearm missiles, ammunition and land mines might be options to reduce the effect of war injuries on the civil population.

For transport accidents, accidental drowning and submersion, falls and assault, low cost intervention policies could be implemented to prevent the occurrence of these injuries among the Palestinian children. These policies could be based on a health education campaign that targeted parents. The media could be used to increase the awareness of the injury problem among the general population, in particular, with respect to transport accident deaths in children aged 0–4 years.

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### Healthy environments for children: facts and figures

Over five million children per year die from illnesses and other conditions caused by the environments in which they live, learn and play.

Around two million under fives die every year from acute respiratory infection, the largest killer of young children. The second most common cause is diarrhoea—a total of 1.3 million deaths each year.

The most common vector-borne diseases are transmitted by mosquitoes. Every year, malaria kills approximately one million children, many of them under five; dengue haemorrhagic fever kills an estimated 10 000, while Japanese encephalitis kills around 8000.

In 2001, an estimated 685 000 children under the age of 15 were killed by unintentional injuries including those resulting from road traffic accidents, falls, burns and drowning. Worldwide approximately 20% of deaths due to such injuries occur in children under 15 years; the vast majority of these occur in low- and middle-income countries.

The Healthy Environments for Children Alliance promotes a number of simple, low-cost, effective and sustainable measures to combat the environmental risks to children. A full listing of what is possible (some of which are simple measures which can be taken at home or in schools) is available on the HECA website: [www.who.int/heca/en](http://www.who.int/heca/en).