The Epidemiology of Injury in School-Aged Children in the Palestinian Territory

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ABSTRACT

Worldwide, injuries are the leading cause of mortality and morbidity in children. However in many parts of the world, especially developing countries, there are scarce data to guide the development of effective interventions and policies to prevent the occurrence of injury in children.

Objectives

To determine the magnitude, scope and characteristics of child injury in the Palestinian Territory and to identify the factors that associated with the occurrence of injury based on analyzing mortality and morbidity data.

Methods

Data on injury mortality were obtained from Palestinian Health Information Centre, and Poisson regression was used to estimate the death rate. A large survey of schoolchildren aged 12 to 16 years - Health Behaviour in School-Aged Children- provided data on injury, socio-economic factors, and health behaviour was used to estimate the prevalence of injury morbidity and to investigate the association between these factors and serious injury, using a logistic regression.

Key findings

Firearm missiles, road traffic crashes, falls and drowning were the leading causes of injury mortality in the Palestinian children. Being a boy, being a child at younger age, riding a bike, reporting of health problems by the children and involving in risky taking behaviours were factors that found to be associated with the occurrence of serious injury.

Conclusions

Prevention actions in the Palestinian Territory should prioritize reduction in mortality caused by RTCs, falls, firearm missiles and drowning. For injury morbidity, prevention measures should consider action strategies for serious injury at different locations- home, school, street and sport facilities- and different activities - biking, sport activity, walking and fighting.

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Full name...AMIRA ALI SHAHEEN.....(please print clearly)

STATEMENT OF CONTRIBUTION TO WORK

The study presented in chapter 2 was published in joint names in 2008 [Shaheen A, Edwards P. Flying bullets and speeding cars: analysis of child injury deaths in the Palestinian Territory. Eastern Mediterranean Health Journal. 2008 Mar-Apr; 14 (2): 406-14.]

I designed the study, obtained the data, analyzed the data with Phil Edwards and drafted the manuscript, that was edited by Phil Edwards.

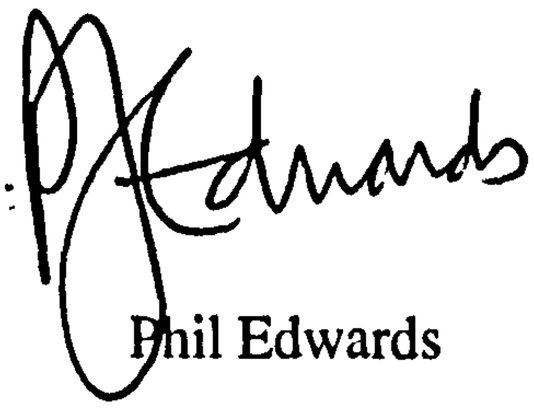
The study presented in chapter 4 was published, as abstract, in joint names in 2008 [Shaheen A, Marshall T, Fletcher A, Edwards P. The epidemiology of unintentional injuries among Palestinian School-Aged Children. Abstract presented at the 9th World Conference on Injury Prevention and Safety Promotion, Merida-Mexico (15-18 March 2008).]

I obtained and managed the data, analyzed the data with Phil Edwards, Astrid Fletcher and Tom Marshall, and drafted the abstract that was edited by Phil Edwards and Astrid Fletcher.

Risk factors presented in chapter 5 was published, as abstract, in joint names in 2008 [Shaheen A, Marshall T, Fletcher A, Edwards P. The determinants of unintentional injuries among Palestinian School-Aged Children. Abstract presented at the 9th World Conference on Injury Prevention and Safety Promotion, Merida-Mexico (15-18 March 2008)].

I obtained and managed the data, analyzed the data with Phil Edwards, Astrid Fletcher and Tom Marshall, and drafted the abstract that was edited by Phil Edwards and Astrid Fletcher.

I endorse this statement as a true and accurate record of the contribution made by Amira Shaheen to those studies presented within this thesis that have been published in joint names.

Signed : 

Phil Edwards

Dated 19/5/2009

Dedicated to

My late father, my mother,

Astrid Fletcher, Phil Edwards,

Ian Roberts and the Palestinian Children

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ABBREVIATIONS

ACCS	Automated Cause Coding System
AIS	Abbreviated Injury Score
ALSPAC	Avon Longitudinal Study of Parents and Children
CBD	Child Behaviour Disorder
CHD	Coronary Heart Disease
CHS-NHIS	Child Health Supplement- National Health Interview Survey
CBR	Community Base Rehabilitation
DALY	Disability Adjusted Life Years
EMRO	Eastern Mediterranean Regional Office
FAS	Family Affluence Scale
GDP	Gross Domestic Product
GNP	Gross National Product
GS	Gaza Strip
GSHS	Global School-Based Student Health Survey
HBSC	Health Behaviour in School-Aged Children
ICD-10	International Classification of Disease-10
IMEMR	Index Medicus for the Eastern Mediterranean Region
IMPS	Injury Minimization Programme for Schools
IMR	Infant Mortality Rate
IRR	Incidence Rate Ratio
ISS	Injury Severity Score
ITR	Israel's National Trauma Registry
MAIS	Maximum Abbreviated Injury Score
MOE	Ministry of Education
NGOs	Non-governmental Organization
ONS	Office for National Statistics
PCBS	Palestinian Central Bureau of Statistics
PHIC	Palestinian Health Information Centre
PLO	Palestinian Liberation Organization
PNA	Palestinian Medical Relief Society
PMOH	Palestinian Ministry of Health
PNA	Palestinian National Authority
PSU	Primary Sampling Unit
RTC	Road Traffic Crash
RTS	Revised Trauma Score
SES	Socio-economic Status
SMR	Standardised Mortality Ratio
SPSS	Statistical Package for Social Science
TBSA	Total Burn Surface Area
UNICEF	The United Nations Children's Fund
UNRWA	United Nations Relief and Works Agency for Palestinian Refugees
VIP	Violence and Injury Prevention and Disability Group

WB	West Bank
WHO	World Health Organization
YPLL	Years of Potential Life Lost
YRBS	Youth Risk Behaviour Survey

DESCRIPTION OF THE THESIS

Worldwide, injuries are the leading cause of mortality and morbidity among children aged over one year. It estimated that each year about 5 million deaths result from injury, and is projected to increase to 8.4 million deaths by 2020. Road related injuries are predominant among children in the developing countries. Disability is another consequence of child injury, with injuries considered to be the third major cause of disability adjusted life years lost. Despite the fact that over than half (53%) of the Palestinian population are children & adolescents aged 19 years and less, injury mortality accounts for 23% and 52% of the total deaths among Palestinian children aged 0-4 and 5-19 years respectively, yet little is known about the causes of injury in the Palestinian Territory. The aim of this thesis is to determine the magnitude, scope and characteristics of child injury in the Palestinian Territory, and to identify factors associated with its occurrence.

Chapter 1 provides a brief background about geography, history, climate, population description, health indicators, health insurance, socio-economic status, and education in the Palestinian Territory. It illustrates as well aims, rationale, and research objectives of the study.

Chapter 2 presents a review based on a systematic search for published articles from Eastern Mediterranean countries and Israel that investigated the occurrence of unintentional injuries among children aged 18 years and under using PubMed. **Chapter 3** presents an analysis of mortality data that were obtained for Palestine, Israel and England & Wales. **Chapter 4** describes the methods used to collect data for the Palestinian Health Behaviour among School-aged Children survey (HBSC). This is a two stage cross-sectional survey of Palestinian children, who reported their experience of injury in the 12 months prior to the survey using a self administered questionnaire.

In **chapter 5**, HBSC data are analyzed to obtain the prevalence of serious injury among the Palestinian children. This distribution was investigated by age, gender and area. In

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In **chapter 5**, HBSC data are analyzed to obtain the prevalence of serious injury among the Palestinian children. This distribution was investigated by age, gender and area. In

chapter 6, HBSC data are used to investigate factors that are associated with the having serious injury among Palestinian school aged children. **Chapter 7** presents the methodological problems that emerged when using the mortality and morbidity data, and how the results in this thesis might be affected by these limitations. The thesis concludes in **chapter 8** by presenting a comparison between the results obtained in this study with those obtained from other published studies that have investigated injury among children (mainly based on the HBSC data.) In addition, recommendations and future suggested work are given.

CHAPTER 1

Country background: Palestinian Territory

1.1 Geography

Palestine lies on the eastern border of the Mediterranean Sea. Its area is 27,000 km^2 (1). The Palestinian Territory covers around 6,160 km^2 and composed of two separate geographic areas, the West Bank (WB) including east Jerusalem and Gaza Strip (2). The West Bank is larger in area; approximately 5,800 km^2, while the area of Gaza Strip is only 360 km^2 (3). The West Bank is divided into four geographical regions: (1) the Northern part includes the districts of Jenin, Tubas, Tulkarem, Qalqilya, Salfit and Nablus; (2) central part that includes districts of Ramallah and Jerusalem; (3) southern part that includes districts of Bethlehem and Hebron; and (4) the Jordan Valley including Jericho. The Gaza Strip is a narrow piece of land divided into five districts including North Gaza, Gaza City, Deir Al-Balah, Khan Yunis and Rafah (3, 4). (Figure 1.1)

1.2 History

The origins of the current Israel-Palestine conflict lie in the establishment of the state of Israel and the subsequent wars and displacement of Palestinian peoples.

In 1993, the Government of Israel and the Palestine Liberation Organization (PLO) signed an agreement that known as "Oslo accord" that aimed to resolve the conflict and established the Palestinian National Authority (PNA). The PNA was divided into three zones according to this agreement. Zone A is mainly urban areas that covers 3% of the Palestinian territory and includes the main urban areas of the West Bank with full control of all civilian administration and security to the PNA. Zone B includes about 450 Palestinian towns and villages that cover 27% of the West Bank with civilian administration under the PNA, and the security responsibility under Israel. Zone C includes agriculture land, the Jordan valley, natural reserves and areas with lower

population density, in addition to Israeli settlements and military areas that cover 71% of the Palestinian territory. Neither civilian administration nor security were under the responsibility of the Palestinian territory in this area (5, 6). Fundamental issues, such as the status of East Jerusalem, refugees and the right to return, Israeli settlement, security arrangements, and borders were all left to the final stage of the negotiations.

With the uprising of the Al-Aqsa Intifada in September 2000, the life of the Palestinian people has become very difficult. Restrictions on movement of peoples and goods were imposed by the Israeli army through establishing 600 checkpoints and physical obstacles throughout the West Bank accompanied by the closure of the Gaza Strip (6, 7). Further restrictions on the freedom of movement, separation of Palestinian communities, and deterioration in the economic situation were imposed by the construction of the separation wall by Israel. In January 2006, the Islamic Resistance Movement (Hamas) won the elections for the Palestinian Legislative Council. Consequently, the newly elected government was boycotted by Israel and the key Western powers. This increased the deterioration in the economic situation in the Palestinian territory and led to clashes between the two major Palestinian political parties: Fatah (the Palestinian National Liberation Movement) and Hamas. As a result of this conflict, and later on in the mid of 2007 Hamas controlled the Gaza Strip and Fatah the West Bank. This situation led to a severe economic situation worsened by the closing the boundaries of the Gaza Strip controlled by Israel and Egypt (7).

1.3 Climate

Palestine, in general, has a Mediterranean climate characterized by long, hot, dry summers and short, cool, rainy winters. In the West Bank, the average temperature in summer season (June to August) is 32 degrees Celsius and in winter season (December to March) 2 degrees Celsius (2). The Gaza Strip has a subtropical climate with four different seasons. It is flat and sandy with little fertile soil. The average rainfall varies from 150 to 350 mm per year.

1.4 Population description

1.4.1 Population size and structure

Palestinian people are part of the Arab nations. The vast majority of Palestinian are Sunni Muslim (94%), almost 6% are Christian, and few are Jews (7). The mid year estimation of the Palestinian population in 2000, in the Palestinian territory, is 3,150,056 individuals. Out of these, 50.5% are males and 49.5% are females. At the time of the census (1997) about 36.1% (1,138,126 individuals) of total population lived in the Gaza Strip, while the other 63.9% (2,011,930 individuals) lived in the West Bank. The main characteristic of the population is that it is young, with 46.9% less than 15 years, 45% of the West bank population and 50.2% of Gaza Strip. The population pyramid (figure 1.2) shows that children under five years of age constitute the largest proportion with 18.5% of the population. The percent of working people (15 – 64) years is 49.5%; 51% in the West bank compared to 46.9% in the Gaza Strip. Adults 60 years and older constitute 4.7% of all population (3, 8).

1.4.2 Population density

Gaza Strip is one of the most densely populated areas in the world. The density in the year 2000 was about 3,161 inhabitants per one square Kilometer, while in the West Bank it was about 347 (8). The most populated districts are Hebron (Al Khaleil) and Gaza city district (figure 1.3). Hebron has the highest number of population in the Palestinian Territory with 13.9% of total population followed by Gaza city district with12.9 % (9).

About 56.6% of the Palestinian population in the Palestinian Territories lives in urban localities, 28.3% in rural and about 15.1% of the population lives in refugee camps (10). In the West Bank, more than 50% of the population lives in rural areas, while in Gaza strip more than 50% of the population lives in eight crowded refugee camps (9) with a population size ranging from 18,300-95,200 individual per camp in Gaza, compared to 1,700 – 18,700 individual per camp in the West Bank (9). The percentage of refugees out of the total population in the West Bank was 32.2%, while the percentage of refugees out of the total population in the Gaza Strip was 74.8%.

1.5 Health indicators

The leading causes of mortality in Palestine are due to non-communicable diseases. Health care is provided through four sectors: the Palestinian Ministry of Health (PMOH), Palestinian non-governmental organizations (NGOs), the United Nations Relief and Works Agency (UNRWA) (provides health care to the Palestinian refugees), and the private sector. Access to health care in the Palestinian territory by patient and medical staff is affected by restrictions on movements that were imposed by checkpoints, physical obstacles and the separation wall (11). Access to health care in the Palestinian territory is associated with the socio-economic status of the population. Three separate studies from the Palestinian territory, based on representative population samples, found that one third of the population were unable to access health services because of the high costs (11). Another study found that failure to access hospital care was predominate in hardship cases and people below the poverty line (11).

The distribution of health facilities is varied between the West Bank and the Gaza Strip and within each district. More hospital beds are available in the Gaza Strip compared to the West Bank (1.4:1.2 beds per 1,000 capita). The distribution of secondary care in both districts is focused in the cities. In contrast, more primary health care centres are available in the West Bank compared to the Gaza Strip (2.1:0.9 centres per 10,000 capita) (11).

1.5.1 Infant mortality rate (IMR)

The infant mortality rate provides information about infant feeding and early childcare practices in the home, accessibility of food, preventive health services and medical care. It is a widely accepted index of the overall health of the population and is used internationally to compare the standards of health and care in different countries (3).

In 2000, IMR was estimated by the Palestinian Central Bureau of Statistics at 22.7/ 1,000. The IMR in the Palestinian Territory declined over the past two decades from 30-40/1,000 in 1980s to 25-30/1,000 in the period 1990-1995 (3).

1.5.2 Total fertility rate (TFR)

The Palestinian Territory has one of the highest total fertility rates compared to other Arab countries, apart from Yemen (6.0 child/woman) (12). As shown by table 1.1, the estimated total fertility rate in the Palestinian territory for the year 2006 was 5.3 child/woman which was higher than that in Syria (3.2 child/woman) and than that in Egypt (3.0 child/woman) (13). A high fertility rate is one of the most important determinants of future living conditions in the Palestinian Territories, which leads to high population growth rate.

1.5.3 Life expectancy

As shown in table 1.1, the life expectancy of the Palestinian people, in 2006 was 73 years. This life expectancy is within the range of the life expectancy of Egyptian people (71 years) and Syrian people (74 years) for the same year (13).

1.5.4 Health insurance

The results of a health survey that was conducted by Palestinian Central Bureau of Statistics (PCBS) showed that health insurance systems covered 60% of the total population in the Palestinian Territories in the year 2000, 31.3% were covered by governmental health insurance, 14.8% were covered by the UNRWA, 11% by private health insurance and 3.3% by social security insurance (14). The governmental health insurance is based on co-payment. It is compulsory for governmental and municipality employees with a monthly premium of 5% of the basic salary and voluntary for each Palestinian individual with a fixed premium of 75 New Israeli Shekels monthly. The insurance package includes primary and secondary health care services that are available in the governmental institutions and diagnostic facilities. The MOH purchases the tertiary health services from Palestinian NGOs and private health facilities from near by countries as Jordan, Egypt and Israel (3). UNRWA provides the basic health services free of charge for all refugees, but the agency purchase secondary health services from other NGOs or from the private sectors and the refugee pay part of the cost (15).

The private health insurance is provided by private agencies for profit making. The insurance provides advanced diagnostic and secondary level services. In the Palestinian Territory (excluding Jerusalem), there were seven companies by the year 1997 providing insurance services. Two of these companies provide policies for individuals while the rest sell only group policies. A number of these companies do not insure those over the age of 60 years, while others do not insure those with diabetes, hypertension, heart disease, congenital diseases, dentistry, optometry, or incurable diseases such as cancer. Premiums depend on the degree of risk, as estimated by the company. The low-income and sick people are usually unable to participate and thus to get coverage (16).

1.6 Socio-economic characteristics

During the last years, the Palestinian Gross National Product (GNP) was influenced by the political situation and restrictions on movement affecting labour. As a consequence of these instabilities, the GNP per capita, decreased from US $ 1,938 in 1998, to about US $ 1,771 in 2000. The Gross Domestic Product per capita (GDP) decreased from US $ 1,540 IN 1998 to US $ 1,484 in 2000 (3). It is estimated that, in 2007 about 52% of Palestinian families were living below the poverty line of US$ 3.15/person/day. Of these, 39.7% were living in the West Bank and 74.4% in the Gaza Strip (7). The numbers of the poor have tripled from 637,000 in September 2000 to nearly two million in March 2003 (7).

As it was stated by the World Bank report, 2003:

"The Palestinian economic situation became worst during the Intifada. Measurement of the economic indicators estimated 50 percent of unemployment rate among the working force. By the end of August 2002, the amount of physical damage resulting from the conflict were about US$ 728 million. The Palestinian exports declined by almost a half and imports by a third during June 2000 and June 2002. Investment shrunk from an estimated US$ 1.5 billion in 1999 to about US$140 million in 2002. Losses in the overall national income between the years 2000-2002 have reached US$ 5.4 billion, that equivalent to one full year of national income prior to the Intifada (17)."

Palestinian people usually live in extended family that is viewed as a protective group for other members in the community. The increasing in poverty in the last nine years has led Palestinian women to have more responsibilities in addition to their role as a caretaker. Palestinian women may be required to take on the role of heads of household following the deaths, disablement or imprisonment of their fathers, brothers, husbands and sons. The consequence of this may be reduced supervision of children with possible consequence of greater risk of injury (18). The results of a report that was published on social and economic situation of Palestinian women covering the period from 1990 to 2004 indicated a significant increase in the percentages of Palestinian women who entered into the formal labor force from 10.4% in 2001 to 14.6% in 2004 (19).

The census report for the year 2007 that was published by PCBS indicated the following main economic activities in the Palestinian Territory: wholesale, retail trade and repairs (54.0%), manufacturing (11.0%), social and personal services (8.3%), agriculture (farming of cattle and other animals, 6.4%), and hotel and restaurant (4.2%) (Table 1.2) (20).

1.7 Education

Education is the largest public service sector run by the Palestinian Authority (PA), and it is compulsory from the age of 6 years to the age of 16 years. Educational services in the West Bank and Gaza Strip are provided by the public authority, by the United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA), and the private sector (21). Apart from the private sector all schools are free. As shown by figure 1.4, the majority of the Palestinian schools (70%) are run by the government. All children either refugee or not could attend governmental schools, while UNRWA schools provide teaching only to refugee children up to the age of 15 years. Palestinian families of high socio-economic status can send their children to private schools. The proportion of the population aged 15 and over who can read and write was estimated to be 92% in the years 2000-2005 (Table 1.1) (13).

The number of schools in the West Bank is treble that of the Gaza Strip (1,597 in the WB, 505 in the GS). Many schools are overcrowded, with some 25% operating on more than one shift. The average students/class in governmental schools is 35, while in the UNRWA the ratio is 44 and 24 in the private schools. The Palestinian school system is a two-stream (Literary and Scientific) that consists of primary and secondary grades. After the ninth school year, student must choose a stream along which to complete the required 12 years of schooling, which end with the Tawjihi (matriculation) exam. Passing this exam is a condition for university or college enrolment. Children with special needs have their own schools (21). The academic year in the Palestinian Territory usually starts at September and ends early in June.

1.7.1 School health programme

A total number of 1,164,225 children were enrolled in the schools over the academic year 2006/2007. In case of trauma, governmental emergency and health department clinics are entitled to cover all traumatic school children that become injured during school activities, such as physical activity, regardless whether they have a health insurance or not (22).

With an aim to maximize the educational achievement of the school children through promoting the physical, mental, social, environmental health and well being of these children, the Palestinian Ministry of Health established the school health programme in the year 1994. This is based on three components. The first is: medical services, e.g. screening programmes that tackle eye, oral, nutritional and hygiene related diseases, congenital abnormalities, mental and behavioural disorders, learning disabilities, child abuse, hearing impairment, infection diseases. The second component of the school health programme is health education, and the subjects covered by this component are based on priorities that are set by the school team. The third component is the schools health environment responsible for water, sanitation, canteens and other physical environmental components. This programme covers children at the governmental schools and few number of the private schools (22).

About 25% of the school children benefit from the screening programmes described above. All school children are covered by the programmes that aim to eliminate the effect of infectious diseases and the other programmes that directed towards increasing awareness of any upcoming health issue among school children. In addition to the Ministry of Health, there are other organizations that have initiated school health programmes. These organizations include UNRWA, that applied similar medical services to that applied by the MOH but in all of the UNRWA schools and a range of non-governmental organization providing health education programmes in the Palestinian schools, such as Palestinian Medical Relief Society (PMRS), the Union of Health Work Committees, Red Crescent and the Community Base Rehabilitation (CBR) that focused in providing visual aids along side the health education (22).

Since the year 1994 up to now the Palestinian school health programme has had several achievements. These include the composition of the school health committee at the national and provinces levels and the composition of the schools health department for each of the provinces. The school health department includes a general medical doctor, dentist, nurse, health educator, inspector for the school environment and the social worker. Local health services were also established to provide health services at a minimum treatment price for the referred school children (22). Although the governmental school health program has made many achievements the program did not include injury as a targeted topic in its agenda.

1.8 Aims of the study

The first aim of this study is to explore the magnitude, characteristics and determinates of injury mortality in children aged ≤ 14 years in the Palestinian Territory over the years 2001 to 2003 and to compare these with data from (i) a developed country - England and Wales (ii) the neighbouring state of Israel. The second aim of this study is to explore the magnitude, characteristics and risk factors of serious injury in children aged 12 to 16 years based on data from a national survey of school children in the Palestinian Territory conducted in 2004. To my knowledge, this is the first study in the Palestinian Territory to look at the epidemiology of injury in children as a result of intentional and unintentional injuries.

1.9 Rationale for the study

The burden of injury is more frequent in developing compared to developed countries. In developed countries, epidemiological research has provided the information needed to formulate strategies for prevention of injury. In developing countries, the scarcity of data on injury leads to lack of awareness and understanding of the problem, which in turns limits the opportunity of implementing appropriate intervention for injury prevention (23). In the research presented in my thesis, I will provide much needed data on the size and causes of injury mortality and morbidity in Palestinian children

In the following section I provide a brief summary of the factors associated with injury in studies conducted worldwide. The source of the summary is the WHO report for 2006. A full literature review based on data from the Eastern Mediterranean countries and Israel is provided in Chapter 2.

1.9.1 Age

Injury mortality as a proportion of all mortality increases with age. In children aged < 1 year, injury contributed by 1 to 1.5% increasing 6%, 25%, and 31% in children aged 1 to 4 years, 5 to 9 years, and 10 to 14 years respectively (23). Available data from the Palestinian Territory, Israel, and England & Wales show that the percentages of children who were aged < 15 years were: 45.7% (10), 28.4% (24), and 16.9% (25) respectively. This underlines the importance of age standardisation to make meaningful comparisons between the countries.

1.9.2 Gender

Overall, for children aged < 15 years, injury deaths in boys exceeded that in girls by 25%. This difference is notable in children from the developed countries (with a difference of about 50% between male to female) compared to children from the developing countries (with a difference of 20% between male to female). According to the WHO report contributory factors to explaining the gender difference might be

"Differences in exposure to hazards, behaviour and socialization as well as differences in social treatment."

Variations in the cause of injury were shown between boys and girls. Apart from burns, all the other causes of injury were predominantly the leading causes of injury death in boys. The proportion of the differences between boys and girls dying from burns varied accordingly with country. This difference was about 60% in children from the low-income countries in the Eastern Mediterranean countries, with girls more exposed to open fire at the time they helped in cooking (23). The results of a household survey that was conducted in the Palestinian Territory, in April 2008, showed that about 12% of the Palestinian households used wood burners for cooking (26).

1.9.3 Poverty

Inequalities in injury are predominant. The injury death rate in children aged < 15 years in low- and middle income countries is about five times higher than that in children from high income countries. Inequalities in injury death were also seen within countries. (23). Children from low socio-economic (SES) backgrounds were at higher risk of injury mortality than those from high SES. My analysis for the causes of injury mortality cannot investigate variation by SES as it is not reported in the Palestinian death certificates.

Theoretical comparison based on data obtained for the unemployment rate in the three countries would suggest that child injury death rate in the Palestinian Territory would be higher than that in Israel and England & Wales. The estimated unemployment rate in the Palestinian (28.4%) (27, 28) in the year 2006 was four times higher than that estimated in Israel (7.3%) (29) for the year 2007, and five times higher than that estimated in the England & Wales (5.3%) (25) for the years 2007.

1.9.4 Environmental factors

Housing conditions and street infrastructures were found to be highly linked to the occurrence of injury worldwide (23). The majority of the Palestinian population are living in urban areas (56.6%), followed by rural areas (28.3%), and refugee camps (15.1%) (10). In normal situations, with the given distributions of the population, I would expect to have more injuries related to urbanization such as road traffic crashes (RTCs). However, the Palestinian Central Bureau of Statistics estimated the private car

ownership to be 24.4 per 1,000 population (30) compared to 232.7 per 1,000 population in Israel and 433.6 per 1,000 population in England & Wales. With these figures, I would expect the death rate due to RTCs in the Palestinian children to be lower than that in children from Israel and England & Wales. Whether Palestinian children died as a pedestrian, or occupants, or cyclist would not be clear, as the death certificate data do not provide data by the mode of transport used.

The results of the demographic health survey that was conducted in the Palestinian Territory in the year 2004 showed that average household size to be 5.8 persons/house (10). This was higher than that in Israel (3.3 persons/house) (24), and in England & Wales (2.2 person/house) (31). The results of another Palestinian survey conducted in 2003 to investigate the characteristics of youth aged 10-24 years indicated that about 76.6% of the Palestinian youth reported home as the place where they spend their leisure time (32). These figures would suggest that Palestinian children are at increased risk of home injury compared to children from other countries. The other places that were frequently reported by children and adolescents in this survey were: friends' or relatives' houses (12.4%), streets (2.2%), worship houses (2.1%), and schools' or universities' clubs (1.6%). In this survey, children and adolescents reported the following as reasons to spend time at homes: lack of money to attend clubs, political instability, and absence of suitable places to play such as parks (32).

1.9.5 Access to health care

Delays in the access of the injured person to health services might lead to delayed recovery, death or permanent disability (23). Almost 60% of Palestinian children are under the coverage of health insurance compared to 100% in each of Israel and England & Wales. It is possible therefore that this difference would influence the overall injury mortality rate or even the prevalence of serious injury. This question, unfortunately, I would not be able to assess it in this research because of lack of data on case fatality or post injury outcome. Health care access can also be affected by other factors in particular the ability to physically access health care. Over the time period that I will investigate mortality the restrictions on mobility, and danger at checkpoints may affect

the case fatality rate as well as making Palestinian people reluctant to seek health care, (33). However as stated above no data will be available to investigate this.

Additional factors to these that were reported by the WHO report will be examined in my thesis. These factors would be the association between the occurrence of serious injury and each of psychological and behavioural factors. Given the limited availability of resources, this research will also help prioritise the most effective interventions for prevention of the occurrence of injury in these children.

1.10 Specific Research objectives

* To estimate mortality rates from injury in Palestinian children aged ≤ 14 years.

* To investigate the causes of injury mortality in Palestinian children aged ≤ 14 years.

* To investigate whether the causes of injury mortality in Palestinian children are similar or different to that in children from Israel or England and Wales.

* To investigate variation in age and gender injury mortality in children from Palestine, Israel, and England and Wales.

* To investigate whether injury mortality in Palestinian children varies by region, i.e. the West Bank or Gaza Strip,

* To estimate the prevalence of serious injury in Palestinian school aged children.

* To investigate whether the prevalence of serious injury in Palestinian school children differs between West Bank and Gaza Strip

* To describe the nature, location and activities of serious injury

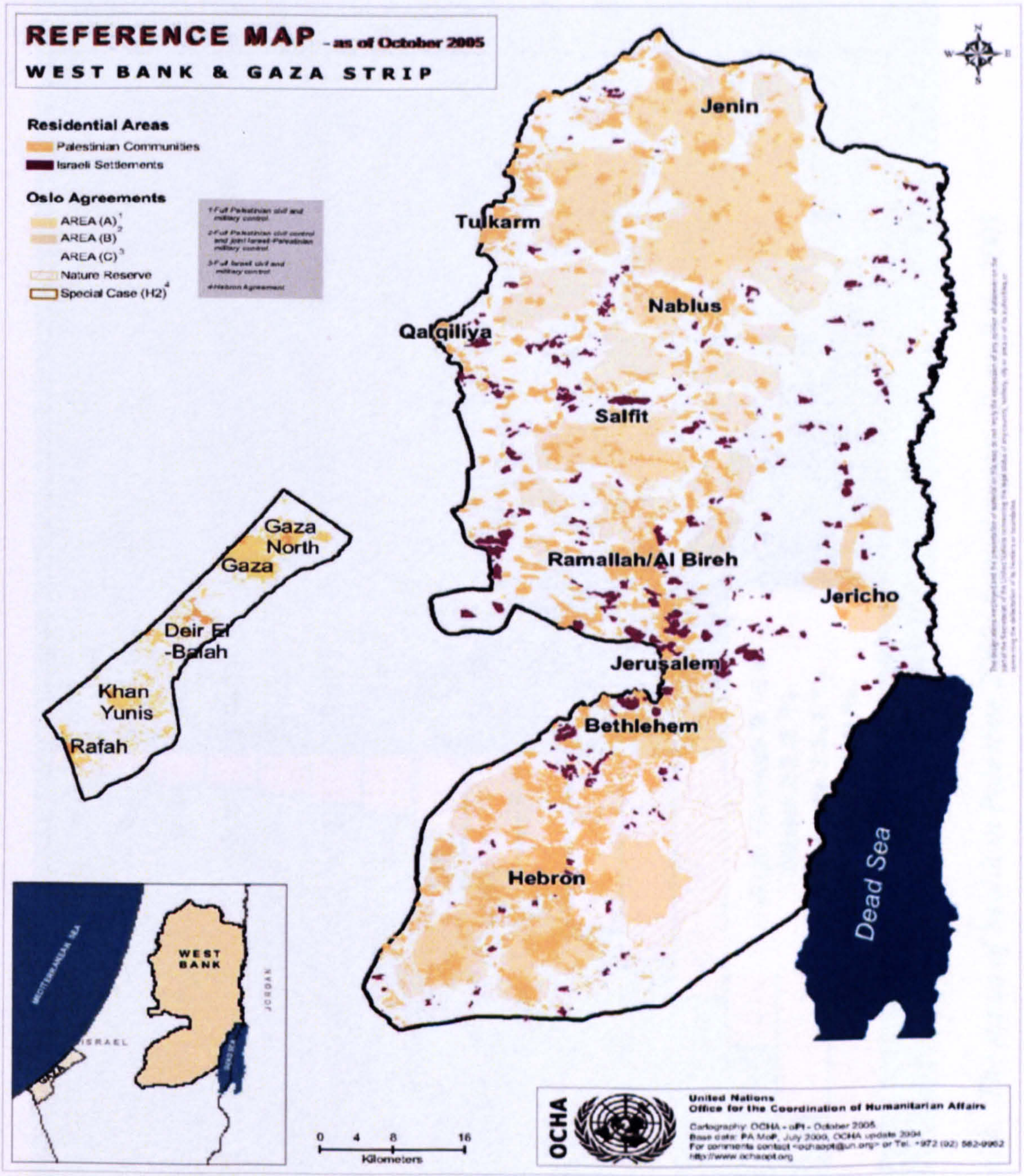
* To investigate the association between socio-economic and demographic factors and serious injury.

* To investigate the association between measures of physical and mental health and serious injury.

* To investigate the association between risk taking behaviour and serious injury.

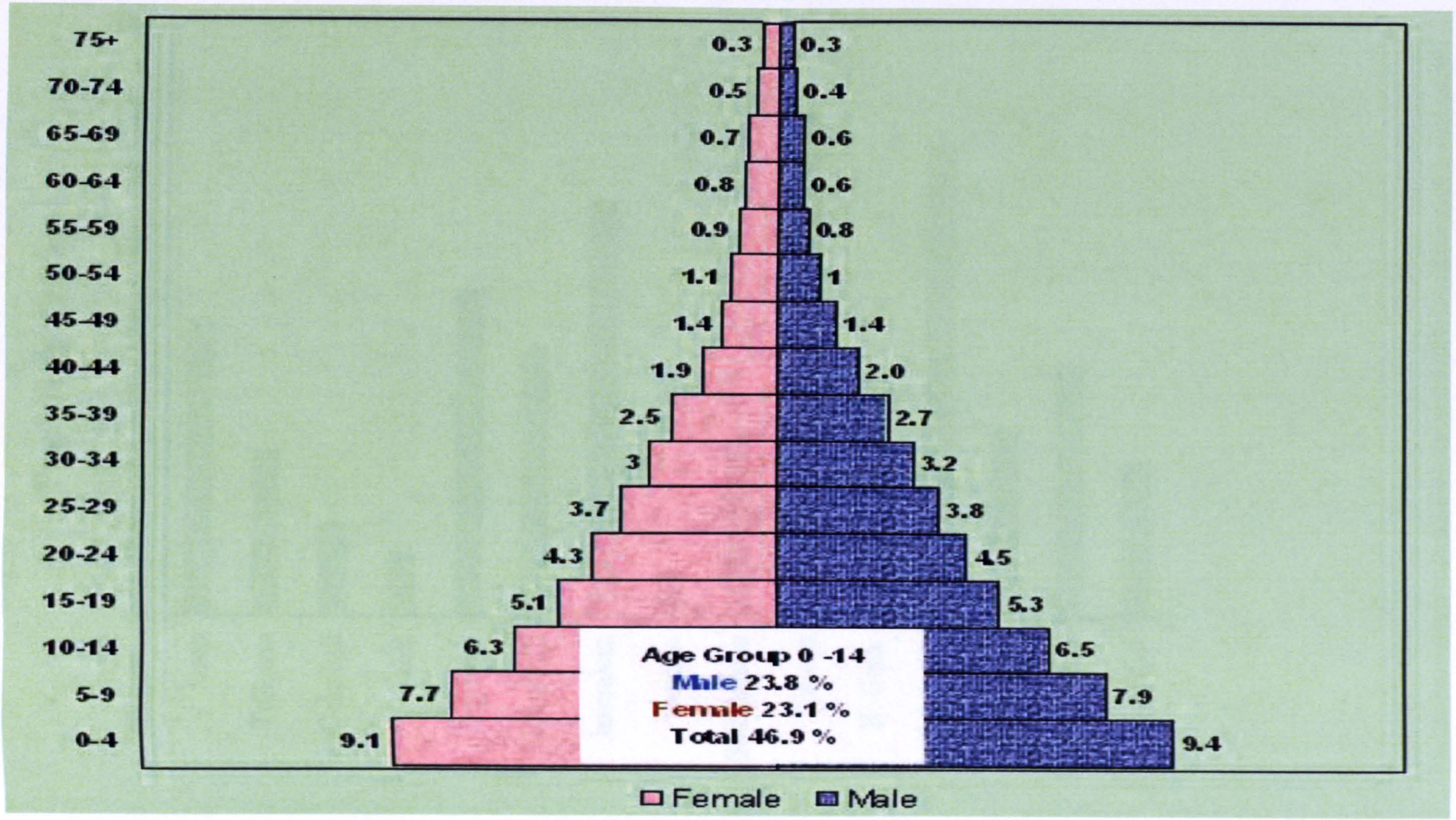
* To suggest intervention policies based on the risk factors that independently found to be associated with the occurrence of serious injury in the Palestinian school children.

Figure 1.1 Map of West Bank Showing Territorial Enclaves under Palestinian Control



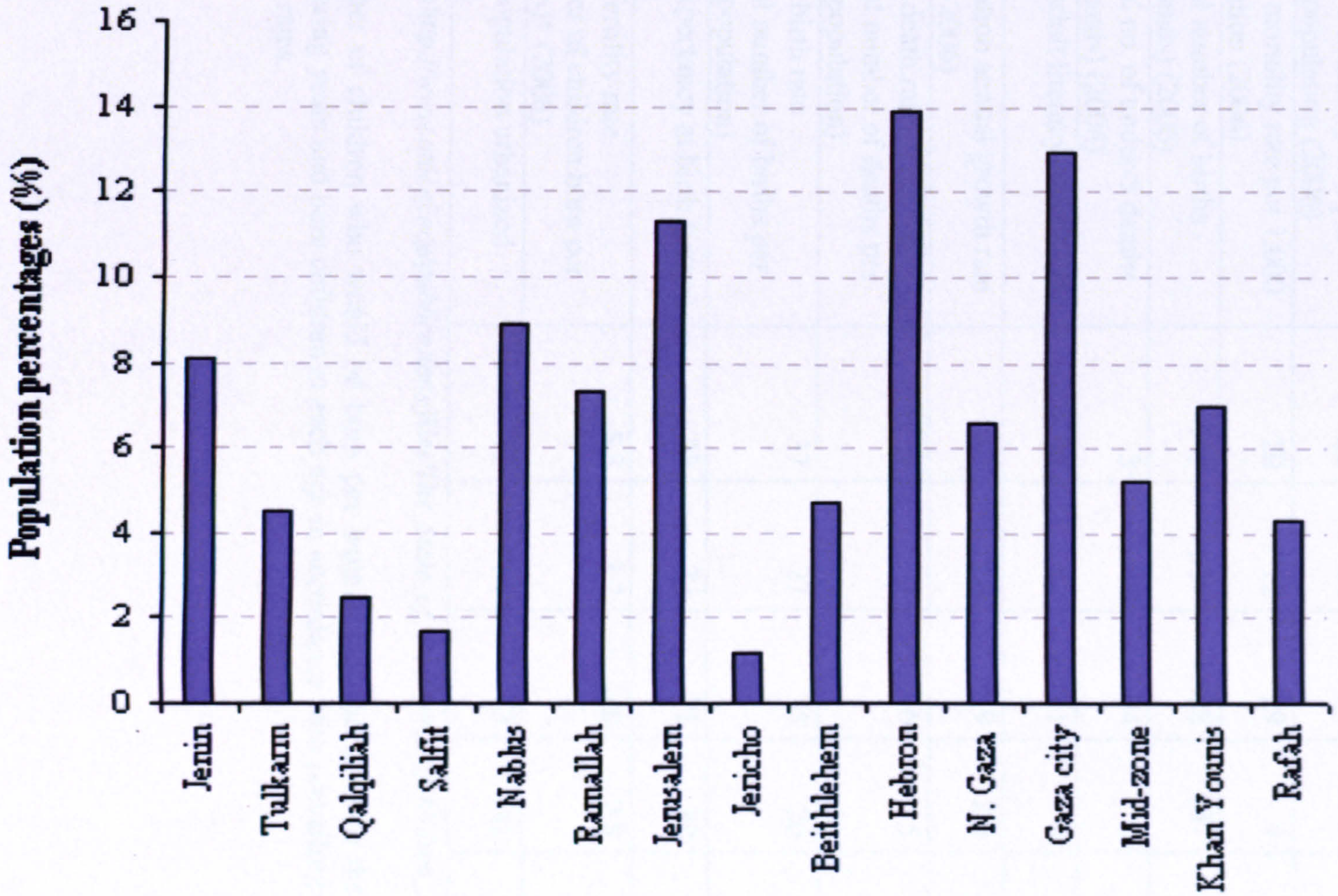
Source: *The World Bank. The economic effects of restricted access to land in the West Bank. October, 2008.*

Figure 1.2 Distribution of population by age group and sex, Palestine, 2000



Source: *Palestinian Ministry of Health. The status of health in Palestine 2000: Annual report. Ramallah; 2001*

Figure 1.3 Distribution of population by governorate, Palestine 2000



Source: *Palestinian Central Bureau of Statistics. Demographic survey for the West Bank and Gaza Strip: Tropical report-housing conditions, detailed results. Ramallah, Palestine; 1997a*

Table 1.1 Palestinian population indicators compared to Syria, Egypt, Israel & UK

Basic indicators	Palestine	Syria	Egypt	Israel	UK
Total population (thousands) (2006)	3,889	19,408	74,166	6,810	60,512
Population under 18 years (%)	2,039 (52%)	8,342 (43%)	29,263 (39.0%)	2,231 (33%)	13,155 (22%)
Population under 5 years (%)	673 (17%)	2,500 (13%)	8,634 (12%)	679 (10%)	3,467 (6.0%)
Under-5 mortality rate per 1,000 population (2006)	22	14	35	5	6
Infant mortality rate per 1,000 population (2006)	20	12	29	4	5
Annual number of births (thousands) (2006)	143	529	1,828	137	715
Annual no. of under-5 deaths (thousands) (2006)	3	7	64	1	4
Total adult literacy rate (2000-2005)	92	81	71	-	-
Population annual growth rate (1990-2006)	3.7	2.6	1.9	2.6	0.3
Crude death rate (annual number of deaths per 1,000 population)	4	3	6	5	10
Crude birth rate (annual number of births per 1,000 population)	37	27	25	20	12
Life expectancy at birth (years) (2006)	73	74	71	80	79
Total fertility rate (number of children born per woman)* (2006)	5.3	3.2	3.0	2.8	1.8
% of population urbanized (2006)	72	51	43	92	90

Source: *http://www.unicef.org/publications/files/The_State_of_the_Worlds_Children_2008.pdf*

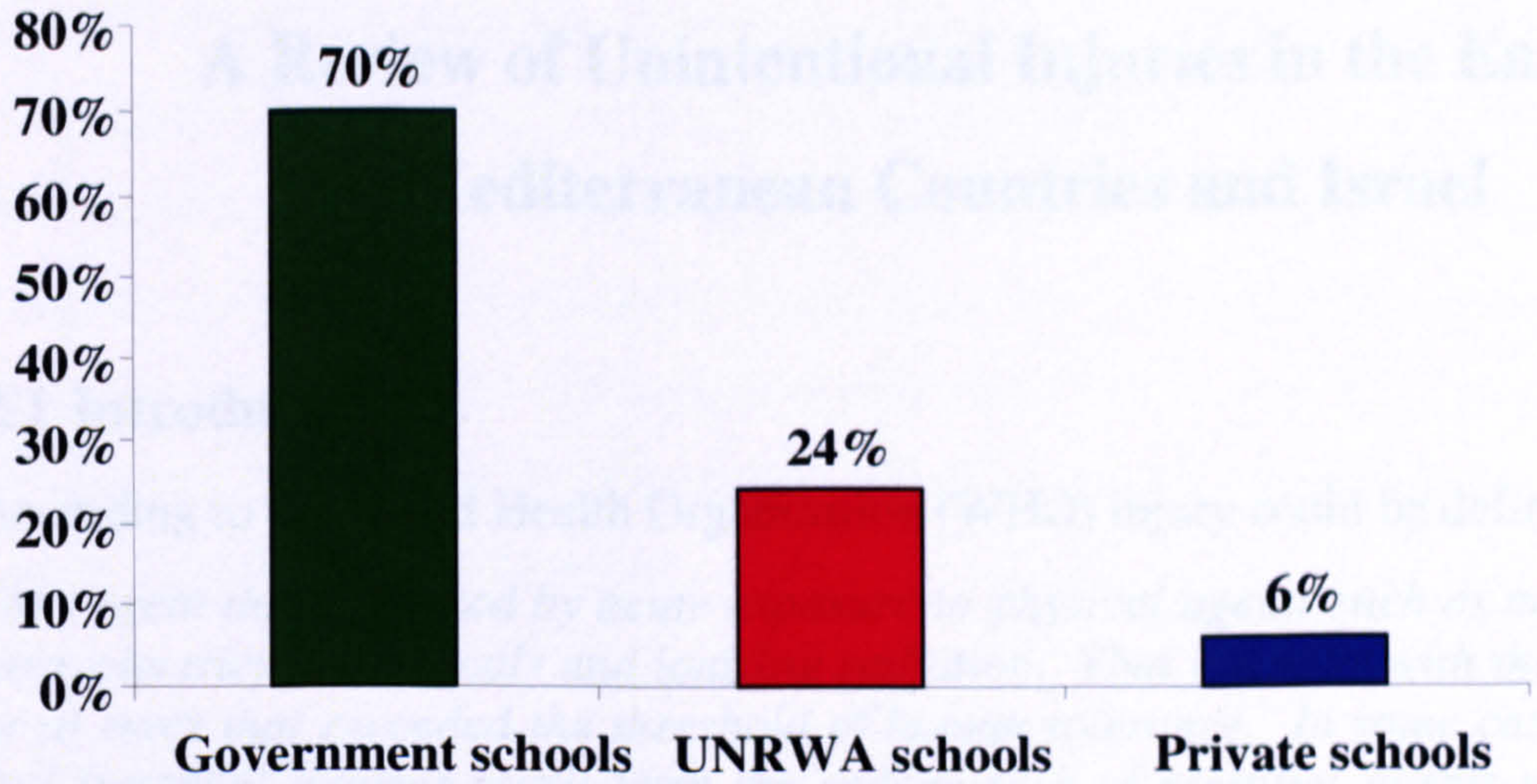
* Number of children who would be born per woman had she lived to the end of her childbearing years and bore children at each age in accordance with prevailing age-specific fertility rates.

Table 1.2 Economic activities in the Palestinian Territory-2007

Economic activity	N	(%)*
Agriculture [farming of cattle and other animals]	6,976	6.4%
Mining and quarrying	299	0.27%
Manufacturing	15,340	11.0%
Electricity and water supply	477	0.43%
Construction	627	0.57%
Wholesale, retail trade and repairs	59,253	54.0%
Hotels and restaurant	4,643	4.23%
Transport, storage and communications	1,215	1.10%
Financial intermediation	844	0.77%
Real estate, renting and business activities	4,304	3.92%
Education	2,384	2.17%
Health and social work	4,260	3.90%
Other community, social and personal services	9,064	8.26%

* These percentages reflect the total number of economic establishments working at each individual sector out of the number of all economic establishments.

Figure 1.4 Distribution of the Palestinian schools by authority-September 2005



Source: *Palestinian Ministry of Education. Statistics about general education in Palestine 2005-2006. December 2005.*

CHAPTER 2

A Review of Unintentional Injuries in the Eastern Mediterranean Countries and Israel

2.1 Introduction

According to the World Health Organization (WHO) injury could be defined as:

"Any event that is caused by acute exposure to physical agents such as mechanical energy, heat, electricity, chemicals and ionizing radiation. That interacts with the body in amounts or at rates that exceeded the threshold of human tolerance. In some cases (e.g. drowning and frostbite) injuries result from the sudden lack of essential agents such as oxygen or heat." (34)

Globally, injuries emerge as the leading cause of morbidity and mortality in children. The contribution of injury to mortality, hospitalization and life long disability is increasingly recognized throughout the world. In 2002, injuries were responsible for about 5 million deaths worldwide (35). This number is projected to increase to 8.4 million deaths by 2020 (36). It is estimated that for each fatal injury there are about 1,000 nonfatal injuries that attend emergency rooms, and about 40 to 80 cases are hospitalized (4). In addition, 14% of all disability-adjusted life years lost (DALYs) is estimated to be due to injury. This proportion is projected to increase to 20% of DALYs for the world's population by 2020. Of all injury causes, road traffic accidents are the third leading cause of DALYs worldwide (37).

In 2002, 13.7% of injury deaths worldwide were in children aged 15 years and less. Most of these deaths (93%) were from unintentional causes, with 98% occurred in children living in low and middle income countries. Globally, gender differences in reporting of injury deaths are observed. The estimated injury death rates in boys and girls aged <5 years were similar, 48.9% and 49.0% respectively (35). These differences in gender are more notable in boys and girls aged 5-14 years, with estimated injury deaths rates of 39.1% and 27.8% respectively (35).

In some developing countries, reliable data on nonfatal injury are scarce due to lack of effective reporting systems. However, there is a growing body of studies that have investigated the occurrence of unintentional injuries in different settings. The findings of most studies are based on available routine data either from hospital and emergency records, or from police and transport statistics. In order to identify published studies that have investigated the distribution and determinants of unintentional injury in children aged ≤ 18 years in Eastern Mediterranean countries and Israel up to now, I conducted a structured search using PubMed.

2.2 Methods

Articles were identified by searching the PubMed bibliographic database using specified search terms (Table 2.1). The search was designed to identify any study that may have investigated the distribution and determinants of unintentional injury in children aged ≤ 18 years, in the setting of the WHO Eastern Mediterranean countries and Israel. The search was designed to identify, as well, any study that was published during the period 1971 to January 2007 and included articles in any languages. Search items included the name of the countries in the region (*"Eastern Mediterranean Region" OR Afghanistan OR Bahrain OR Djibouti OR Egypt OR Iraq OR "Islamic republic of Iran" OR Morocco OR Algeria OR Oman OR Pakistan OR "Saudi Arabia" OR "United Arab Emirates" OR Kuwait OR Qatar OR Cyprus OR Somalia OR Sudan OR "Syrian Arab Republic" OR Tunisia OR Yemen OR "West Bank" OR "Gaza Strip" OR "Palestinian Territory" OR Palestine OR Israel*). Search terms also reflected the target population (*Child* OR adoles* OR young* OR youth**). The search terms used to reflect the intention of injury were *accident* OR unintent* OR "non natural" OR "non fatal"*, and also included synonyms for 'injury' (i.e *trauma* OR wound* OR injur**). No hand-searching of paper journals was conducted. I attempted to include unpublished articles from Arab countries on unintentional injuries by sending e-mails to experts whose names were listed on the web-site of Violence, Injuries and Disability groups, branch of WHO office of Eastern Mediterranean Region.

This search strategy yielded 291 articles. The abstracts for all articles identified were then carefully screened for potentially relevant studies. In cases where, from the abstract, it was unclear whether the study was eligible, the full text of the article was also examined. Examination of the abstracts and the full texts from the PubMed search resulted in the selection of 71 potentially relevant articles for retrieval. Those not marked for retrieval fell into the following categories: (1) publication type was either an editorial or commentary, (2) not studied injury at all, (3) not investigated injury in children, (4) not broken down by the age of the population, (5) war related injury, (6) psychological trauma, (7) studied the pathology of injury, (8) impact of injury treatment, (9) injury prevention and intervention policies, (10) economic cost of injury, and (11) studied improvement of injury registry and coding. Figure 2.1 presents how the final number of included articles was obtained.

2.2.1 Data extraction

For each of the 71 articles, information was extracted on the following: authors' name, the setting in which the study was completed, study design, study subjects, injury outcome and main outcome results (Table 2.2). Table 2.3 presents the results of specific articles with injury prevalence of 20% or more. The eligible articles were distributed by country: Bahrain (1, 1.4%), Egypt (5, 7.1%), Iran (4, 5.7%), Iraq (1, 1.4%), Israel (20, 28.6), Jordan (8, 11.4%), Kuwait (5, 7.1%), Lebanon (3, 4.3%), Pakistan (6, 8.6%), Saudi Arabia (9, 12.8%), Sudan (1, 1.4%), Syrian Arab Republic (1, 1.4%), Tunisia (2, 2.8%) and United Arab Emirates (4, 5.7%). No published articles were identified on unintentional injuries in children in the following countries: Palestine, Yemen, Somalia, Cyprus, Qatar, Oman, Morocco, Libyan Arab Jamahiriya, Djibouti, and Afghanistan.

2.3 Results

All of the retrieved studies, except one, were descriptive. They describe the general characteristics of injury in children with respect to demographic factors (e.g. age, gender and race), the geographic distribution of child injuries (e.g. urban and rural) and the time of injury occurrence (e.g. month of the year). The findings of descriptive studies are helpful in formulating hypotheses, but cannot test hypotheses as they lack appropriate comparison

groups. One analytical (a case-control) study was identified. Studies were then classified according to the cause of injury. A separate review of results of studies based on data from the Health Behaviour in School-aged Children (HBSC) survey conducted outside the Eastern Mediterranean region or Israel will be presented in the discussion (Chapter 8), since my study (chapters 4, 5, 6) uses the same HBSC protocol.

2.3.1 Road Traffic Crashes

The results of a representative study conducted in Bahrain revealed that road traffic crashes (RTCs) were the leading cause of injury in the Bahrain population, among those admitted to the intensive care unit, with a proportion of 57%. Pedestrians were more likely to be admitted, and 2.7% of these cases were children aged ≤15 years. In this study injury was defined as injury or poisoning cases that required admission to ICU (38). In Iran, of the population who were referred to the only head and maxillofacial centre in the country, 2% were children, aged less than 10 years, who suffered from facial fracture due to RTCs (39). In another study in Iran, when health houses were randomly selected, the results showed RTCs were the leading cause of injury mortality in Iranian children aged ≤ 14 years living in rural areas, with a proportion of 37.5% of overall injury deaths (40).

The result of a review that investigated injury mortality in Israeli children showed that about 8% of injury mortality was due to RTCs. This study highlighted that children aged 10 to 14 years were at highest risk of being killed by unintentional RTCs (41). In a study that investigated injury inequalities in Israeli children aged 0 to 17 years, RTCs were the leading cause of injury mortality and morbidity. Cases were included if they were admitted to the hospital with unintentional injury that led to either morbidity or mortality, or both (42). In a population based study in Israel 19% of injuries in Jewish children were due to RTCs and required longer hospitalization than other injuries. Only injuries that attended the emergency room services were investigated by this study (43). The results of a study conducted using the Israel's National Trauma Registry (ITR) found that road traffic crashes were the second cause of injury in Israeli children aged 0-17 years. In this study, children aged 5-14 years were injured when using the road as either a pedestrian or cyclists.

Furthermore, hospitalization caused by road traffic crashes were predominant in children aged 15-17 years (35.9%) compared to other injury causes in this age group (44). However the results are not representative of the general child population, since the data used only children who arrived at the emergency room and who were then hospitalized (44).

When the computerized death certificate and road accident data of the Israeli Central Bureau of Statistics were reviewed, RTCs emerged as the leading cause of injury mortality, in children aged ≤ 17 years, with a rate of 5.2 deaths per 100,000 children. In this study, the injury definition was not reported (45). RTCs were identified as the third cause of emergency room visits, in Israeli children aged ≤ 17 years. In this study injury was defined as:

"unexpected violent event that affects the child with or without detectable injury and leads to medical attention in an emergency room" (46).

The investigation of causes of injury, in children aged less than 13 years attending the emergency room of a general hospital showed that about 8% of RTCs occurred in the presence of a carer. However, the sample of children used might not be representative of other children in this area, since there are other hospitals serving the catchment population. In addition, injury defined as any requiring of hospital admission during the nine months prior to the survey (47).

RTCs were the main trauma cause (39.3%) in children, aged ≤ 16 years, admitted to the ICU at a general hospital in the north of Jordan over one year period (48). Although the investigation was limited to serious injury, this is the only hospital serving people in this area, and so the children are representative of the whole paediatric population living in this area. The results of another study conducted in Jordan, over a five year period, to review the occurrence of oral and maxillofacial fractures found RTCs to be the second cause of fractures in children aged 1 to 15 years. The representativeness of this study is questionable, because the study was conducted at a teaching hospital, and it might be that only children from low socioeconomic status attended this hospital (49). The causes of maxillofacial injuries, in children and adults were investigated in another study in

Jordan. The results revealed that the majority (61%) of injuries in children aged ≤ 18 years, admitted to the plastic surgery unit, were caused by RTCs. The representativeness is unclear, since this study was also conducted in a teaching hospital. Furthermore, patients with minor injury were not admitted to the plastic surgery unit (50).

In Lebanon, the causes of injury morbidity in patients attending the emergency service at a teaching hospital were investigated (51). In children aged ≤ 14 years, RTCs were the second cause of injury morbidity (16.4%). Since the emergency room served the majority of people living in Beirut city and its suburbs, the study is representative of the catchment population (51). The results of another Lebanese study found that road traffic were the cause of 13.2% of referrals in children aged ≤ 18 years to the University of Beirut Medical Centre (52). These results might be an underestimate if children were referred to other hospitals, or did not attend the hospital for treatment.

When the causes of injury in Pakistani children, aged ≤ 15 years, admitted to the ear, nose and throat department in a teaching hospital were further investigated, RTCs were found to be the fourth leading cause of injury (15.6%). In this study, contribution of RTCs increased with increasing child age, peaking at ages 10 to 15 years with proportion of 27%. This study might be under-representative of children with minor injuries (53). The determinants of RTCs in Pakistani children were investigated in a case-control study. The cases were children admitted to a paediatric hospital with RTC injury, and the controls were children admitted to the same hospital with other injuries. The majority was injury to pedestrians (68%). Since a case-control design was used in this study with controls recruited from hospital, it is more likely for children with serious injury to admitted to the hospital, thus the controls used here are under-represented of the children with minor injury in the community (54).

When the emergency records of Edhi Ambulance Service Foundation were reviewed for the causes of injury, RTCs were found to be the most frequent cause of injury in Pakistani children aged ≤ 15 years, with a proportion of 80% of all injuries. The sample used was

fairly representative of the child population in Pakistan, since Edhi services covered a wide range of Pakistani area, and it is almost the biggest charity ambulance service (55). About 48% of blunt abdominal trauma in Pakistani children, aged 7 to 12 years, was caused by RTCs. Although this investigation was conducted by reviewing the medical records at a general hospital over a 10 year period, the small sample size used might indicate that not all children seek medical treatment for this injury, and so the time scale of blunt injury in children might be under-estimated (56). In Saudi Arabia, RTCs were the most frequent cause of oro-facial injuries in children aged ≤ 15 years, with a proportion of (60.5%). The data collected for this study were fairly representative of the study area, where oro-facial patients were referred from other hospitals in the area to this hospital (57).

As revealed by reviewing the medical records of Saudi children aged ≤ 12 years, RTCs were the second leading cause of thoracic injuries. In this study, inclusion was limited to any child sustaining thoracic injuries during a 6 year period of the review. Over this period, 91 children were reported to have thoracic injury, which could be related to the fact that either thoracic injury is uncommon within children, or due to the referral of patients to other hospitals. In this case, this sample might not be representative of the child population at this area (58). RTCs frequently occurred in children aged less than 10 years in Saudi Arabia (59). However, the sample used in this study suffers from limitations that make it hard to generalise to the child population, such as the small sample size, the exclusion of cases referred by other hospitals, and those who died before arrival to hospital (59).

The result of another study conducted in Saudi Arabia showed that, 8% of fractures in children were caused by RTCs. In this study the age distinguishing between children and adult was not clear (60). When the medical charts of the children, aged ≤ 12 years, who were involved in RTCs and admitted to the King Fahad National Guard Hospital over a 10 year period, were investigated, the results showed that 71% of the children were pedestrians, 27% were passengers, 1.5% were cyclists and 0.5% were motorcyclists. Furthermore, children aged 1 to 8 years were at increased risk of having crash injuries compared to other ages (61). Since the catchment area of this hospital is limited, children

with minor injury and those who attend other hospitals for treatment might not be represented by this study.

The investigation of injury causes in Sudani children aged ≤ 15 years found that 16% of fractures were caused by RTCs (62). The study was conducted over six months in a teaching hospital, and so the sample could have under-represented all children living in this area and did not attend hospital for treatment. In addition, the inclusion of children in this study was based on radiological confirmation of the fracture (62). In Syria, the result of a representative study conducted over one year to investigate causes of permanent incisors injuries in children aged 9 to 12 years showed that RTCs were the second cause of permanent incisors injuries, accounting for 24% of injuries (63). It is believed that data on injury morbidity is not satisfactory, even in developed countries, due to unavailability in accident registration system (64). This is reflected in a study conducted in the United Arab Emirates to investigate the causes of injury morbidity and mortality in children attending a general hospital in this country. RTCs were the leading cause of injury mortality with a proportion of 65%, while for morbidity the proportion that was RTCs was 3.1% (64).

In a study of children aged ≤ 14 years in Arabian Gulf countries, RTCs were the frequent cause of injury occurrence in children aged 5 to 14 years (65). This study was conducted in a teaching hospital, where the treatment is free, thus it is more likely to refer children from low socio-economic families to it. In addition, children who died before arrival at the emergency room were excluded from this study. Thus the sample might be suffered from selection bias. In a study of 624 pedestrians with RCTs injury, the proportion of children injured as a pedestrian was 42.6%. As the data were extracted from the police reports, pedestrian who died at hospital might be excluded from this sample (66).

2.3.2 Falls

A study conducted at three hospitals in Jerusalem, investigating children aged ≤ 17 years, found falls to be the leading cause of injury hospitalization. The overall proportion of falls in these children was 28.8%. This proportion decreased with increasing child age.

However, children with mild injuries were under-represented in this study (67). When the pattern of hospitalization was investigated in children who attended Rambam hospital in Haifa, falls emerge as the leading cause of injury in children aged ≤ 14 years with a proportion of 32%. Children with mild injuries were under-represented in this study (68). The results of another Israeli study indicated that non-Jewish children from northern Israel, aged ≤ 14 years, were at increased risk of having severe injury due to a fall (85%) compared to Jewish children of the same age (69). In a cross-sectional survey conducted in Jerusalem, falls were observed as the main cause of dental injuries in school children aged 9 to 13 years (45.2%) (70). In another Israeli study, children aged ≤ 4 years were at higher risk of having falls than those aged 5-14 and 15-17 years respectively (44).

Falls were found to be common in children aged ≤ 13 years attending the emergency units following an accidental injury in Jerusalem, with proportion of 43%. This was based on a convenience sample: where any child brought to medical care with unintentional injuries was included in the sample (71). When the causes of injury in children that attended health centres in northern Israel were observed, falls were predominant in children aged ≤ 18 years (43%). However this study underestimated children with mild injury and children who were referred to other health centres (72). The result of a representative study conducted in Iran, to investigate unintentional home injury in the Iranian population found that, about 55% of the injuries were sustained by children under the age of 15 years. Furthermore, falls were the cause of 15.6% of these injuries (73). A study in the United Arab Emirates found that falls from camels were the major cause of injury morbidity in children aged 4 to 15 years (94.8%) (74). A pilot study of injury in Bedouin children treated at Sulaibiya Health Centre indicated that falls was the predominant cause of injury in children aged ≤ 14 years with a prevalence of 25.5% (75). The results of this study might not be generalized to the total child population in Kuwait, since the catchment area of the hospital is limited to the Sulaibiya.

Among Jordanian children aged 0 to 6 years over 5 months, falls were identified as the major cause of injury hospitalization (41.5%). Children who attended other hospitals and

those died outside the study hospital were excluded from the sample used for this investigation (76). In another Jordanian study, half of the injuries in children aged 7 to 15 years who attended a teaching hospital with traumatic dental injuries were caused by falls. This study might have over-estimated injury prevalence in children of low socioeconomic status, who are likely to attend free and low cost health services (77). In addition, when the medical records of Jordanian children attending a dental teaching hospital over a one year were reviewed, falls were found to be the frequent cause of injury in children aged 15 months to 14 years (80%) (78). However, this study only included children with severe dental injury (78). In a prospective Lebanese study, falls were found to account for 42% of injuries in children aged ≤ 18 years (52). In another Lebanese study, using hospital records, falls were found to contribute to 21.3% of all injury morbidity in children aged ≤ 18 years. These results might be representative of the child population attending that hospital, but not the general population, where children could be attended other hospitals (79).

In Egypt, the majority (85.7%) of mandibular fractures in children aged ≤ 10 years was caused by falls. Since this study was conducted in a teaching hospital, there is a possibility that children of lower socioeconomic status were over-represented by this study (80). In Egypt, a study among school pupils indicated that almost half the injuries (49.0%) in school pupils aged 5 to 24 years were caused by falls. As only pupils attending the emergency room were investigated, pupils with mild injury may have been under-represented (81). In a cross-sectional study conducted in Pakistan to investigate the injury profile in females in two adolescent schools, falls were the major cause (87%) of injury in pupils aged 11 to 14 years (82). Since a convenience sampling was used, children from other schools are under-represented (82). In Tunis, falls were the leading cause (38%) of injury in children aged ≤ 14 years who attend the emergency room of the regional hospital of Jbeniana. As this study was conducted in an agricultural location, this result may be lower than might be expected for more urban areas in Tunis due to differentiate in building environment (83).

2.3.3 Burns

Hot liquid was the predominant cause of burn injury in children aged ≤ 14 years (68.6%) in Israel. The study found a significant decreasing trend of burn with age. However, data on the total burn surface area (TBSA %) were not available, thus the degree of burn is not specified (84). In another Israeli study, burns emerged as the leading cause (36.1%) of home injury in children, aged 3 days to 18 years, attending a local health care centre. This study investigated a high prevalence of injury in children aged ≤ 2 years. Children with mild injury and those who did not attend the hospital were under-represented (85). In another Israeli study infants (22.1%), males (68%) and non-Jews (62.3%) were at highest risk of burn injury (86).

Burns were the cause of 15% of all injuries in children aged ≤ 15 years, admitted to a general hospital in Israel (87). In Jordan, a 10 year review of the records of the Forensic Medicine department in the Jordanian Ministry of Health and Jordan University Hospital found that a high proportion of injury (64.9%) in children aged ≤ 14 years was due to burns. This sample excluded children with electric and chemical burns (88). In another Jordanian study, a review of medical records on burn injury in 338 patients who attended the major referral hospital for treatment of burns was conducted. The study highlighted that about half of burns injuries (54.0%) occurred in children aged ≤ 14 years (89).

The result of a prospective study conducted on 560 children treated for injury in a specialized hospital in Kuwait found that most injuries (49.8%) in children aged ≤ 12 years were caused by burns. This study covered five years and included all children with TBSA 10% or above (90). In a study of 3,680 Kuwaiti patients who died from burn injury, the proportion of children aged ≤ 15 years was 20.9% (91). The study was based on data extracted from medical records of two units to which all burn cases required hospitalization (91). Adults with TBSA 15% or more and children with TBSA 10% or more were included in the study (91). A prospective study in Kuwait on the causes and determinants of burn injury in 765 cases found that burns frequently occurred in children aged ≤ 5 years, and the home was the common place for their occurrence (92). A two year prospective study on

394 Kuwaiti children with burns found that 95% of burns occurred at home. Three percent of these children died as a consequence of their injury (93).

In an Iraqi study based on the medical records of 1,350 patients seeking treatment from burns at the Italian Red Cross Hospital, the proportion of children aged ≤ 14 years was 23%, with a TBSA more than 20% (94). Two Egyptian studies were found to investigate burns in patients with total burn surface area > 10%. In both studies, approximately 40% of patients were children aged ≤ 15 years (95),(96). One study conducted in Saudi Arabia found that 62% of patients admitted to the governmental hospital (with the only burn unit in Jeddah) were children aged ≤ 18 years. In this study, children with thermal injury were prospectively investigated over a period of 2 years (97). A cross-sectional study conducted over one year to investigate the causes of burn injury in patients admitted to Pakistan ordinance factory hospital, found that 37.8% of the patients were children aged ≤ 10 years (98).

2.3.4 Other Injuries

In an Israeli study, contusion was prevalent (79%) in school children aged 14 to 18 years (99). In this study, pupils were requested to report their injury experience during the previous 10 to 12 years that required medical attention and treatment. This study is subject to recall error, as injury cases could be either over, or under-estimated (99). In a study on 846 Saudi males with sport injuries, the proportion of children aged 7 to 10 years was 5.5% (100). Causes of hand injury were investigated in Saudi children aged ≤ 12 years who admitted to a teaching hospital over a 10 year period; the majority (30.1%) of these injuries were caused by a door jam (101). In Egypt, a study was conducted to investigated the causes of potash poisoning showed that, potash poisoning frequently occurred in children aged < 5 years (102). Injury due to a TV falling on a child was investigated in Israeli children aged 0-18 years. The results found that children aged 1-2 years were at increased risk (54.3%) of this injury than children in other age groups. The findings of this study might have underestimated this injury, since the data are obtained from trauma centre that represent only five emergency centres, and thus could not be generalized to the other Israeli

children (103). The investigation of childhood accident profile by a Tunisian researchers found 7% of children suffered from poisoning from scorpion bites, and a relatively high percent of children, aged ≤ 14 years, died from bites (104).

2.3.5 Risk Factors

2.3.5.1 Socioeconomic status

When the epidemiology of severe paediatric fall trauma was investigated by Israeli researchers the results showed that children of low socioeconomic status were at increased risk of experiencing severe injury compared to children of higher socioeconomic status (69). Positive associations were indicated between the cause of injury, e.g. burn and poisoning, and the family socio-economic status in two Egyptian studies (95),(102). On the other hand, other studies have reported either negative or no significant associations between the occurrence of serious injury and family socio-economic status (76), (99), (70). An Israeli study investigated the association between hospitalization and ethnicity found that, the proportion of severe and in-patient injury deaths in non-jewish children (12%) was twice than that in Jewish children (6%). However, when socio-economic status was taken into account, only falls were the predominant of injury hospitalization in non-jewish compared to jewish with proportions of 13% and 8% respectively (44).

2.3.5.2 Supervision

Several studies investigated the association between the quality of supervision and the occurrence of injury. About one third of the injury in Israeli children occurred in the presence of another sibling (67). In the same study, the authors reported that 17% of the injuries in the children occurred in the absence of supervision by adult (67). The results of another Israeli study revealed that the occurrence of injury increased at lacking of parental supervision, and this risk decreased with age (87). A strong association was also found between injury occurrence and lack of teacher supervision, which decreased with increasing pupils' age (87). A study in Israel found that children cared for by their older sibling were at risk of injury (71). In a case-control study conducted in Islamabad, child pedestrians were found to be at high risk of being killed by RTCs. The cases in this study were

children with injury, while the controls were children admitted to the hospital from other causes but not injury (54). This risk was higher within children lacking supervision and suitable places to play (54). In Kuwait, lacking of supervision was negatively associated with burn injury in children aged 12 years and less (90).

2.3.5.3 Family size

The size of a child's family was reported to be associated with injury by several studies. Studies conducted in Jordan and Israel reported positive associations between the larger family size and the occurrence of injury in the children (76), (87), (71). The results of a study conducted in Kuwait found that burn injury was predominant in children aged ≤ 12 years who were from large families (90). In Egypt, a study that investigated the determinants of potash poisoning in children, reported that children coming from larger families were at higher risk of being poisoned (102). A study in Pakistan of pedestrian injuries found an association between family size and uneducated mother with being killed on the road (54).

2.3.5.4 The use of seat belt and bicycle helmet

A study on the causes of RTCs in patients who attended an emergency room in a teaching hospital in Saudi Arabia found none of the children who injured as a car passenger was using a seat belt (59). In another study, none of the Saudi children who were suffering from thoracic injury and were car passengers at the time of injury had been wearing a seat belt (58). In Iran, the result of a study that investigated children's cycling injuries found that none of the children were wearing bicycle helmets at the time of injury (105). In the United Arab Emirates a study of 200 children who were treated in the emergency room with head injury found that only two children reported using a bicycle helmet (106). In addition, when a pooled data set from the Health Behaviour in School-Aged Children (HBSC) survey was analyzed, the results revealed a high prevalence of bicycle-related injuries that authors related to the variation in reporting of the use of bicycle helmets by children (107).

2.3.5.5 Access to health care

The severity of injury could be affected by access to health care. In a study conducted in Pakistan to investigate the pattern of gastrointestinal perforation in children, the authors reported that the severity of trauma was directly associated with the duration of seeking health care after getting injured (56). In Iraq the use of check points can lead to transport delays. As a consequence, delays in access to health care within most of the burn patients can occurred (94). An Israeli study suggested that injury in non-Jewish children might be under represented as the authors of this study believed most minor injuries are treated at other hospitals nearer to site of injury (44).

2.4 Summary

In this review of literature on unintentional injury in children in the Eastern Mediterranean countries, I have included 70 descriptive studies and one case-control study. Routine data, from medical services and police reports, transport statistics and bureau statistics were the main data sources in the majority of these studies. The leading causes of unintentional injuries in children were road traffic crashes, burns, and falls. The following factors were identified as potential risk factors for injury: Socioeconomic status, quality of supervision, family size, using seat belt and bicycle helmet, and access to health care. In most studies, there was a predominance of injury in boys rather than girls. Many studies did not provide a precise injury case definition.

Though no studies were identified that had investigated the occurrence of unintentional injuries in the Palestinian children, I am expecting that the leading causes of injury mortality and morbidity in the Palestinian children will resemble those observed in published studies from Eastern Mediterranean Countries and Israel. However, injury rates in the Palestinian Territory might be higher compared to those observed in the articles identified. High poverty rates in the Palestinian Territory might influence the prevalence of owning a car by the Palestinian families, which in turn may lead to Palestinian children being more exposed to risk of road traffic injury as pedestrians rather than as car occupants.

Furthermore, road traffic crash casualties might expect to be higher in the Palestinian children due to the lack of proper places to spend leisure time compared to Israeli children.

Further effects of poverty might be seen in having unsafe places to live in, where most of the Palestinian children are thought to inhabit incomplete constructed homes that lack staircases and other safety equipments to keep drugs and detergents safe. This might lead to an increase in injury due to falls and burns. Burns may also be expected to be higher in the Palestinian girls compared to Israeli girls because of the frequent involvement of Palestinian girls in cooking, with some using open fires. As a result of the continuous conflict, Palestinian children as well as Israeli children are frequently exposed to injuries due to this conflict. However, clear influence is expected to mark the injury mortality rate in the Palestinian children mainly in the Gaza Strip that had a special feature as the most populated area in the world. This fact, crowdedness, is expected to influence the overall and the specific injury rate in the Gaza Strip.

A high growth rate in the Palestinian Territory may have impacted on family sizes and could be expected to impact on mothers' supervision of their children; as their being involved in other household work. Lack of supervision would increase the risk of injury, mainly with the other members of the extended family being busy in securing economic support to their family. Lastly, due to check points and road blocks, possible delay in access to health care for injured Palestinian children might be expected that could increase the cases of serious injury and even injury deaths compared to the Israeli children.

Table 2.1 Search strategy used to identified the articles that investigated the occurrence of unintentional injury in children in the Eastern Mediterranean countries and Israel

#	DATA BASE	SEARCH TERMS	RESULTS (TOTAL)
1	Pubmed	"eastern Mediterranean region" OR Afghanistan OR Bahrain OR Djibouti OR Egypt OR Iraq OR "Islamic republic of Iran" OR Jordan OR Lebanon OR "Libyan Arab Jamahiriya" OR Morocco OR Algeria OR Oman OR Pakistan OR "Saudi Arabia" OR "United Arab Emirates" OR Kuwait OR Qatar OR Cyprus OR Somalia OR Sudan OR "Syrian Arab republic" OR Tunisia OR Yemen OR "West Bank" OR "Gaza Strip" OR "Palestinian territory" OR Palestine OR Israel	47,355
2	Pubmed	Child* OR adoles* OR young* OR youth*	1,744,019
3	Pubmed	Accident* OR unintent* OR "non natural" OR "non fatal"	29,524
4	Pubmed	Trauma* OR wound* OR injur*	146,421
5	Pubmed	#1 AND #2 AND #3 AND #4	291

Table 2.2 Characteristics of the included studies

Authors name & Study Ref.	Setting	Design	Subjects	Injury outcome	Results
Bahrain					
Ruehsen MM et al. (1989) (38)	Intensive care unit, Salmaniya Medical Center	Retrospective analysis of medical records over a two year period.	364 patients aged 0 to 70+ years.	Morbidity and Mortality, cases admitted to the ICU with injury and poisoning cause.	* Road traffic crashes (RTCs) were the leading cause of injury admission. 10 of the admitted patients were pedestrian children aged less than 15 years. * Falls were the second leading cause of injury, fifty percent (8 cases) of the fall cases were children aged 9 years and less. * Home was the common place of falls occurrence.
Egypt					
Sakr K et al. (2005) (80)	University of Alexandria Hospital	Retrospective analysis of medical records over a 10 year period.	509 patients aged 2 to 70 years.	Morbidity, mandibular fractures.	* In patients aged 0 to 10 years, falls were the leading cause of mandibular fracture. * Sports were the leading cause of mandibular fracture in patients aged 11 to 20 years.
Hemeda M et al. (2003) (96)	Burn Unit, Ain Shams University	Prospective collection of data from medical records over a 5 year period.	880 patients aged 0 to 75 years. Of which 344 children aged 0 to 14 years.	Morbidity, burns, degree not specified.	* Prevalence of burns was higher in boys than in girls aged 0 to 14 years. * Prevalence of burns was higher in females than males aged 14+ years. * Home was the most common place where injuries frequently occurred. * Injury occurrence increased during winter and spring.

Continued .....

Egypt					
Authors name & Study Ref.	Setting	Design	Subjects	Injury outcome	Results
Kamel MI et al. (1999) (81)	Emergency Department of the Students' Hospital in Alexandria	Prospective collection of data using a standard interviewing form over one year.	3,422 school students aged 5 to 24 years.	Morbidity, school injury defined as any injury that occurred at school, or as a result of school activities, or that occurred while going or coming form school.	* 37.1% of injuries occurred inside the school building. * 35.5% of injuries occurred at the playground. * 27.4% occurred outside the school. * Fall and struck by or against objects were the most common mechanism of injury. * Contusion and fracture were the frequent types of injury occurred in the students. * A significant association was detected between each of the age, referral method, type of injury and the injury severity.
El-Badawy A et al. (1998) (95)	Ain Shams University Burns' Unit	Retrospective analysis of medical records over one year.	305 children aged 0 to 15 years.	Morbidity and Mortality, burns (degree not specified).	* Boys experienced more injuries than girls. * Home was the most common place of injury occurrence. * Injury occurrence increased during winter and spring. * Burns were common in children of low income families. * Scald was common in children at younger age. * Burns by flame were common in older children. * 4.3% of children were died from injury complications.
Waguih IM et al. (1971) (102)	Pediatric Hospital of Cairo University	Retrospective analysis of medical records over one year.	Children aged from 1 to 5+ years (upper age is not specified).	Morbidity, Potash poisoning injuries.	* Socioeconomic status was strongly associated with potash poisoning. * Children in large families and children aged less than 4 years were also at higher risk.

Continued .....

Iran					
Authors name & Study Ref.	Setting	Design	Subjects	Injury outcome	Results
Kadkhodaie MH et al. (2006) (39)	Teaching hospital in northern Iran	Retrospective analysis of medical records over a three year period.	7,200 patients aged 2 to 76 years.	Morbidity, Maxillofacial injuries.	RTCs, falls and assaults were the main causes of facial bone fracture in children aged 0 to 10 years.
Mohammadi R et al. (2005) (73)	Health house	Retrospective analysis of medical records over one year period.	79,723 patients, including 40,925 children aged ≤ 14 years.	Morbidity, home related injuries.	* Half of injuries occurred in children aged 15 years and less. * The highest incidence of injury was observed in children aged 0 to 4 years. * Home injury was predominant in males aged 15 years and less.
Soori H. (2002) (105)	Accidents & Emergency departments of all hospitals in Ahwaz	Cross-sectional study to interview parents of children, injured due to cycling over one year period.	1,079 children aged 15 years and less.	Morbidity, Injury was defined as "a sudden external occurrence leading to cycling injuries that attend to an Accidents and Emergency department in the city for medical treatment".	* Injuries in children frequently occurred at street and home. * Boys were more frequently injured at street. * Head was the frequent part of the body affected.
Soori H et al. (1999) (40)	6,267 health houses in 13 rural provinces	Cross-sectional study to analyze injury mortality by interviewing relatives of descended from rural area over one year period.	Patients with unintentional injuries aged 0 to 65+ years.	Mortality, injury defined as the event that occurs unintentionally and led to death.	Males aged 5 to 14 years were at risk of being killed by unintentional injuries, mainly from RTCs and falls.
Iraq					
Carini L et al. (2005) (94)	Medical City Hospital	Prospective collection of data from medical records over 45 days.	48 patients aged from 8 moths to 45 years.	Morbidity and Mortality, Burn injury: admitted with a deep second and third degree with total body surface area (TBSA) from 20% to 85%.	* 5 children were admitted due to scalding and 6 were admitted due to injury in role-play. * Some patients died due to delay in health care resulted caused by transportation difficulties caused by check points and road blocks.
Israel					
Schwartz S et al. (2005) (71)	Emergency care station (TEREM) and the Shaare Zedek Medical Center	Prospective collection of data from medical records over December 2000 to June 2003.	333 children aged 13 years and less.	Morbidity, injury was defined as that required a treatment by a doctor or a hospital visit.	* Children from large families are frequently injured. This could be related to the quality of supervision and seeking health care.

Continued .....

Israel					
Authors name & Study Ref.	Setting	Design	Subjects	Injury outcome	Results
Bar-Joseph N et al. (2007) (69)	Intensive care units in hospitals in Northern Israel	Retrospective collection of data from medical records over four years.	188 children aged 0 to 14 years.	Morbidity, severe injury due to fall which was defined as a fall from one level to another.	* Annual rate of fall was 11.4 per 100,000 children. * More than 85% of fall injuries occurred in non-Jewish. * Falls from staircases, balconies and roofs account for 93.7% of the fall cases in non-Jewish children.
Haik J et al. (2007) (86)	Israel National Centre for Trauma and Emergency Medicine Research	Data on injured people over the years 1997 to 2003 were extracted from the medical records.	5,000 people aged 0 to 70+ years.	Morbidity and mortality. Injury definition was not reported.	* The occurrence of burn in males was twice in females. * The majority of burns occurred at home (58%). * 2nd and 3rd degrees of burn were predominant in children aged 0 to 1 year (22.2%).
Molcho M et al. (2006) (107)	A cross-country comparison	Cross-sectional survey.	52,955 children aged 11, 13 and 15 years.	Morbidity, severity of injury defines as that required medical treatment by a crutches, cast, stitches or overnight hospitalization. And that leading to lost days from school or any other normal activities.	* The prevalence of serious injury in the children was 41.3%. * Injury in boys was higher than in girls. * Injuries were predominant at home and sport facility. * About 4.1% of the injuries were contributed by fighting.
Wilf-Miron R et al. (2007) (108)	Israel National Centre for Trauma and Emergency Medicine Research	Case series.	116 children aged 0 to 17 years.	Morbidity and Mortality. Injury defines as that resulted from the TV being fallen on the children.	* 54.3% of children were find to suffer from TV falls. This injury was predominating in boys. * 75% of head and neck injuries were resulted. * 4 children died from their injury
Savitsky B et al. (2007) (44)	Israel National Centre for Trauma and Emergency Medicine Research	Retrospective study of patients included in the Israel's National Trauma Registry.	32,009 children aged 0 to 17 years.	Morbidity, injury definition was not reported.	* Falls contributes to about 51% of the injuries; with 6% of children suffering from sever injury due to fall. * RTC contributes to about 23% with 14% of the children having severed injury due to it. * Burns contribute with 7%, and 20% of children suffer from sever burn.

Continued .....

Israel					
Authors name & Study Ref.	Setting	Design	Subjects	Injury outcome	Results
Sgan-Cohen HD et al. (2005) (70)	Fifth and sixth grades in 15 schools in Jerusalem	Cross-sectional survey. Telephone interview with the parents of children with severe injury.	1,195 children aged 9 to 13 years.	Morbidity, dental injury was diagnosed according to simple and brief visual inspection and answer to the question whether the missing tooth was due to injury.	* Fall was the main cause of dental trauma in the school children. * The experience of trauma at the following places was common: school (32.2%) and home (31.4%). * No significant association was found between dental trauma and socioeconomic status. * More boys than girls experienced dental trauma.
Morad M et al. (2004) (41)	Medline and PubMed	Literature review on injury mortality in Israeli adolescents.	29 studies were identified.	Mortality, causes and trends in injury mortality rates.	* Israeli children aged 15 to 17 years are at risk to be killed by unintentional injury. * RTCs were the leading cause of death in children aged 10 to 14 years. * Drowning was predominant in Arab children and adolescents.
Miron D et al. (2003) (72)	Clalit Health Services in Northern Israel (excluded clinics in the Arab community)	Prospective study conducting during the year 2000.	2,086 children aged 0 to 18 years.	Morbidity, injury definition was not reported.	The most common injuries in children were: * Falls (43%), blows (23%), burns (15%) and cuts (13%). While injuries were predominant in the following places: * Home (31%), school (32%) and elsewhere (37%).
Broides A et al. (2003) (85)	Primary care clinic in Aroer	Prospective collection of data by interviewing the patients or their parents over one year.	219 children aged 3 days to 18 years.	Morbidity, Injury was defined as that required attendance to the health care service due to home injury.	* The five leading causes of injury in children, at home, were burns (36.1%), falls (28.5%), contusions (13.2%), lacerations (12.3%) and nail penetrations (8%). * Burns were predominant in children aged less than two years.

Continued .....

Israel					
Authors name & Study Ref.	Setting	Design	Subjects	Injury outcome	Results
Brook U et al. (2003) (87)	Edith Wolfson Medical Centre	Retrospective analysis of medical records over one year period.	314 children aged 15 years and less.	Morbidity, injury definition was not reported.	* Children were frequently injured at: home (52.3%), road (19.3%), sports (17.4%) and school (11.6%). * The risk of injury increased in families with more than one child, it is increased with lacking of supervision by both parents and teachers.
Gofin R et al. (2002) (42)	23 Emergency Rooms (ER)	Cross-sectional survey to analyze injury using medical records over one year period.	11,058 children aged less than 17 years.	Morbidity and Mortality, injury definition was not reported.	* Admission to ER by Jewish children was 1.5 times higher than that in Arab children. * Hospitalization rate in Arab children was 1.1 times higher than that in Jewish children. * Falls, being stuck by objects and RTCs were the leading causes of injury in children.
Shani E et al. (2000) (84)	Kupat Holim Klallit "health care centre"	Retrospective analysis of data based on computerized medical data over a 10 year period.	1,050 children aged 0 to 14 years.	Morbidity, burn injury.	* Burns caused by chemicals and contact with hot objects were predominant in Jewish children. * Burns in children aged 0 to 4 years were caused by hot liquids. * In children aged 5 to 14 years burns were related to fire.
Ittai S et al. (2000) (68)	In patient at Rambam Medical Centre	Retrospective analysis of data from medical records over a two year period.	1,049 children aged 0 to 14 years.	Morbidity and mortality. Injuries due to falls (not further specified).	* Children from rural areas were at high risk to be killed by injury due to falls, mainly the Arab children. * The prevalence of injury due to falls was higher in children aged 5 years and less.
Gofin R et al. (1999) (67)	Three main hospitals in Jerusalem	Retrospective analysis of medical records over one year period.	432 children and adolescents aged 0 to 17 years.	Morbidity. Injury definition was not reported.	* Home was the sole place where injury occurred. * Injury prevalence was high in children aged 0 to 3 years, at the presence of adult person. * Falls was the most frequent cause of injury hospitalization.

Continued ....

Israel					
Authors name & Study Ref.	Setting	Design	Subjects	Injury outcome	Results
Brook U et al. (1997) (99)	A high school in the city of Holon	Cross-sectional study based on interviews of the student at the school.	279 school students aged 14 to 18 years.	Morbidity. Injury defined as all injuries, regardless of the place of occurrence, which required medical examination and treatment since the beginning of elementary school.	* The leading causes of injury morbidity in the pupils were: contusions (79%), fractures (15.4%), animal bites (5.5%) and burns (1%). * At the following places the pupils were at risk to be injured: road (26.4%), school (23.1%), sport facilities (28.6%) and home (22%). * There was no significant association between injury occurrence with either parents' occupation or economic status.
Gofin R et al. (1991) (43)	Emergency rooms in four hospitals and the first-aid station in Jerusalem	Retrospective analysis of medical records over one year period.	3,760 Jewish children aged 0 to 17 years.	Morbidity. Injury was defined as the event that needs attendance at emergency room services.	* The most frequent causes of injury in children visiting the emergency rooms were: falls and being struck by a blunt or sharp object. * Children with poisonings, road accidents and burns required longer hospitalization.
Barell V et al. (1990) (45)	Central Bureau of Statistics	Retrospective extraction of injury data from the computerized death certificate over a 5 year period.	841 children under the age of 18 years.	Mortality, injury definition was not reported.	* The leading causes of injury mortality in the children were: RTCs (5.2/100,000) and drowning (1.7/100,000). * Non-Jewish children aged 1 to 4 years were at higher risk of injury due to RTCs. * Jewish children aged 15 to 17 years were at higher risk of RTCs. * Drowning was the common cause of injury in non-Jewish children. * A predominance of male over female was noted.

Continued .....

Israel					
Authors name & Study Ref.	Setting	Design	Subjects	Injury outcome	Results
Gofin R et al. (1989) (46)	Emergency rooms in four hospitals and the first-aid station in Jerusalem	Retrospective analysis of medical records over one year period.	123,630 Jewish children aged 0 to 17 years.	Morbidity. Injury defined as medically attended unintentional injuries.	* The leading causes of injury in the children were: falls (38.5/1000), being struck or caught (21.1/1000) and road accidents (5.4/1000). * High incidence of burns was indicated in girls aged 6 years and more. * High incidence of poisoning was indicated in girls aged 13 to 17 years. * Head injury was more frequently occurred in children and it decreased with increasing the age of the child.
Attias D et al. (1982) (47)	Rothschild University Hospital	Cross-sectional study conducted by interviewing the parents of children admitted to the hospital over a 9 month period.	260 children aged 13 years and less.	Morbidity. Injury definition was not reported.	* The leading cause of injury morbidity was RTCs. * Head was the frequent site getting injured. * Most of RTCs were occurred at the absence of the care taker, and it was common in children aged more than 6 years. * Home was the common place where most of the injury occurred. * The percentage of injury in males was higher than that in females.
Jordan					
Rajab LD. (2003) (77)	Dentist teaching hospital	Retrospective analysis of medical records over a four year period.	2,751 children aged 7 to 15 years.	Morbidity, traumatic dental injuries.	* Children aged 10 to12 years were at high risk of dental injuries. * The leading causes of injury in children were: fall (49.9%), sport (8.7%), violence (7.7%) and collision with people or inanimate object (7.3%).

Continued .....

Jordan					
Authors name & Study Ref.	Setting	Design	Subjects	Injury outcome	Results
Harahsheh BS et al. (2002) (48)	Intensive care unit (ICU) at general hospital serving the north of Jordan	Prospective collection of data from the medical records over one year.	107 children aged 16 years and less.	Morbidity, admitted to ICU.	*Accidents around home are predominant in children. * 39% of trauma in children was caused by RTCs. * 33% of injuries were caused by Burns. * Falls contributed to about 17% of the trauma in the children. * Forty four percent of the children were diagnosed with head injury.
Qudah MA et al. (2002) (49)	Oral Surgery Departments of the Jordan University of science and Technology and Princess' Basma Teaching hospital	Retrospective analysis of medical records over a five year period.	227 children aged 1 to 15 years.	Morbidity, maxillofacial fractures.	More than half of the facial fracture was due to accidental falls. While 20% was due to RTCs, 17% result from assaults and 8% resulted from sport injuries.
Al-Jundi SH. (2002) (78)	Dental teaching hospital, Irbid	Retrospective analysis of medical records over one year.	620 children aged 15 months to 14 years.	Morbidity, dental injury.	* The prevalence of dental trauma occurs most frequently in children aged 10 to 14 years. * Fall was the most common mechanism of injury. * Home was the most common place of injury occurrence.
Janson S et al. (1994) (76)	Princess' Basma Teaching hospital	Prospective collection of data from the medical records over a sex month period.	142 children aged 0 to 6 years.	Morbidity, admitted to hospital.	* Home was the sole place of injury occurrence in children aged 0 to 6 years. * The prevalence of burn was high in younger children. * Fall was common in children aged 3 to 4 years. * Knocked by a car was common in children aged 4 to 6 years.

Continued .....

Jordan					
Authors name & Study Ref.	Setting	Design	Subjects	Injury outcome	Results
Karyouti SM. (1987) (50)	Plastic surgery unit, Jordan University Hospital	Retrospective analysis of medical records over a two year period.	131 patients aged 0 to 50+ years.	Morbidity, maxillofacial injuries.	* Children aged 0 to 5 years were at high risk of having maxillofacial injuries. * The leading causes of these injuries were: RTC and violence.
Abu Ragheb S et al. (1984) (88)	Departments of Forensic Medicine in the Ministry of Health and Jordan University Hospital	Retrospective analysis of medical records over a ten year period.	390 patients aged 0 to 50+ years.	Mortality, burn injuries.	* 95% of burns in infant and children were due to scald. * Most of the burns injuries occurred at home.
El-Muhtaseb H et al. (1983) (89)	Jordan University teaching Hospital	Retrospective analysis of medical records over a five year period.	338 cases aged 0 to 45+ years.	Morbidity and Mortality, burn injuries.	* Burns frequently occur in children less than 5 years. * 96% of burns in children age 15 years and less were occurred at home.
Kuwait					
Bang RL et al. (1988) (92)	Burns Unit at IBN Sina Hospital and Plastic Surgery Unit at Mubarak Al Kabeer Hospital	Prospective collection of data from medical records over a three year period.	765 patients age 0 to 70+ years.	Morbidity and Mortality, burn injuries.	* Children aged 5 years and less were the most vulnerable population to burn. * Most of the burn cases were caused by scald of hot water at home.
Lari AR et al. (1992) (93)	Surgery Unit at Mubarak Al-Kabeer hospital	Prospective collection of data from medical records over a three year period.	394 children aged 0 to 12 years.	Morbidity and Mortality, burn injuries.	* Scalds were the cause of burn in children aged 6 years and less. * Flames were the cause of burn in children aged 7 to 12 years. * Most of the burn cases occurred at home. * Twelve children out of the 394 burned child died.
Bang RL et al. (2000) (91)	Burns Unit at IBN Sina Hospital and Plastic Surgery Unit at Mubarak Al Kabeer Hospital	Retrospective analysis of medical records over a five year period.	234 patients aged 0 to 65+ years.	Mortality, burn injuries.	* Children aged 5 years and less were frequently died from burn injury. * Most of injury cases occurred at home. * Domestic accidents, flame burns, inhalation injury and pre-existing medical diseases found to be the determinants of burn injury.

Kuwait					
Authors name & Study Ref.	Setting	Design	Subjects	Injury outcome	Results
Bang RL et al. (1997) (90)	Burns Unit at IBN Sina Hospital and Plastic Surgery Unit at Mubarak Al Kabeer Hospital	Prospective collection of data over a four and half year period.	1,125 children aged 0 to 12 years.	Morbidity and Mortality, burn injuries.	* The majority of burn injury (73%) occurred in children aged 2 to 5 years. * Most of these injuries occurred at home, mainly in the Kitchen due to scald of hot water. * Lack of supervision and large family size are the two determinants of burn injury.
Bayoumi A. (1985) (75)	Sulaibiya Health Centre	Cross-sectional pilot study over 4 months.	509 children aged 0-14 years.	Morbidity. Fall injuries.	* Fall was the predominant cause of injury in the children (25.5%). * Home injuries were common in children aged less than 5 years.
Lebanon					
El-Chemaly SY et al. (2007) (52)	American University of Beirut Medical Centre	Prospective collection of data using a questionnaire.	214 children aged 0 to 18 years.	Morbidity. Severity of injury defined as: admission to the ICU.	* Fall injuries were common in the children (42%). * RTCs were common in the children (13.2%). * Burns were common in the children aged less than 5 years.
Gerbaka B et al. (1996) (79)	Hotel-Dieu de France Hospital	Cross-sectional study based on reviewing the medical records.	1,671 children ≤ 18 years.	Morbidity. Injury definition is not reported.	The most frequent injuries in the children were: * Falls (21.3%) * RTC (8.9%) * Poisoning (5.7%) * Burns (5.0%)
Abou-Daoud KT. (1974) (51)	Emergency Service at the American University of Beirut	Prospective collection of data from medical records over a six month period.	2,410 injured patients aged 0 to 60+ years.	Morbidity. Injury definition was not reported.	The leading causes of injury in children aged ≤ 14 years were: falls, foreign bodies, RTCs and lacerations.
Pakistan					
Khan N et al. (2006) (98)	Pakistan Ordinance Factory (POF) Hospital	Cross-sectional study based on data collected from medical records over a nine month period.	Children aged more and less than 10 years.	Morbidity, burn injuries.	Children aged less than 10 years were at high risk of burned due to scalds at home.

Continued .....

Pakistan					
Authors name & Study Ref.	Setting	Design	Subjects	Injury outcome	Results
Khan AR et al. (2005) (53)	Ear, Nose and Throat (ENT) departments at DHQ Hospital, Khyber Teaching Hospital	Prospective collection of data from medical records over a two year period.	160 Children aged 15 years and less.	Morbidity, ear, nose and throat injuries.	* A pointed object in the mouth was the cause of throat injury in children aged 5 years and less. * Fall was the cause of injury in children aged 5 to 10 years. * RTCs were the common cause of injury in children aged 10 to 15 years.
Shaikh MA et al. (2005) (82)	Two girl's middle schools in Islamabad	Cross-sectional survey. By using a structured, self-administrated and anonym's questionnaire, data were collected.	182 school girls aged 11 to 14 years.	Morbidity, injury was defined as that required a treatment by a doctor or a hospital visit.	* Falls were the predominant type of injury reported by school girls. * The most frequent sites getting injured were: arms or hands. * Home was the sole place of injury occurrence.
Singer MS et al. (2004) (54)	Children Hospital (CH) of the Pakistan Institute of Medical Sciences	Case-control study by using interview technique between October and December 2000.	190 cases and 150 controls of children aged 0 to12 years.	Morbidity. Injury definition was not reported.	* Pedestrian children were at high risk to have RTCs. * Lack of supervision and suitable places for playing, large family size and uneducated mother were the determinants of RTCs in this study.
Razzak JA et al. (2004) (55)	Edhi Foundation, emergency vehicles service	Retrospective case series. Data were extracted from the medical records over a three year period.	1,320 cases of injured children aged 15 years and less.	Morbidity and Mortality. Injury definition was not reported.	* RTCs, falls, burns and drowning were the leading causes of injury in children. * Almost 15% of the children died due to either RTCs or drowning.
Zafar A et al. (2003) (56)	General Surgical Units of District Hospital and Ayub Teaching Hospital	Retrospective analysis of medical records over a 10 year period.	25 children aged 7 to 12 years.	Morbidity and Mortality, gastrointestinal perforation injuries.	* The leading causes of the gastrointestinal perforation in the children were: RTCs (48%), falls (44%) and struck by animals (8%). * The seriousness of the gastrointestinal perforation was found to increase with delay in seeking for medical treatment. Where 24% of the children died due to this.

Continued .....

Saudi Arabia					
Authors name & Study Ref.	Setting	Design	Subjects	Injury outcome	Results
Al-Ghamdi AS. (2002) (66)	Data were collected from police and hospital records in Riyadh	Retrospective analysis of medical records over a two year period.	638 patients aged 2 to 67 years.	Mortality, deaths resulted from pedestrian-vehicle crashes.	* Children aged 1 to 9 years and young adult aged 10 to 19 years were at high risk to be injured as a pedestrian. * Head injuries were frequently occurred.
Lawoyin TO et al. (2002) (57)	Data were collected from the medical records of hospital in Al-Baha	Prospective collection of data from medical records over a five year period.	473 children aged 0 to 15 years.	Morbidity, oro-facial injuries.	* Fall was the mechanism of injury in two third of the children mainly in children younger than 6 years. * Most of falls were occurred at home. * RTCs were predominant in children older than 6 years.
Crankson SJ. (2006) (61)	King Fahad National Guard Hospital	Cross-sectional study based on retrospective reviewed of medical records over the period January 1994 to December 2003.	664 children aged 12 years and less.	Morbidity. Road Traffic Crashes injuries.	* 71% of the children were injured as pedestrian. * 27% of the children were injured as passenger. * 1.5 % of the children were injured as cyclists.
Crankson SJ et al. (2001) (58)	Data were collected from medical records of hospital in Riyadh	Retrospective analysis of medical records over a 6 year period.	91 children aged 12 years and less.	Morbidity and Mortality, thoracic injuries.	* The leading cause of thoracic injury in children aged 12 years and less is RTCs. Mainly in pedestrian. * None Of the occupant children restrained seatbelts. * More boys than girls were affected by injury.
Al-Hoqail R et al. (2000) (101)	Data were collected from medical records of a university hospital	Retrospective analysis of medical records over a three year period.	101 children aged 12 years and less	Morbidity, hand injuries.	* Of the children aged 0 to 12 years, hand injuries were predominant in children aged 4 years and less. * Most of the hand injury caused by doors mainly at home.
Shanks NJ et al. (1994) (59)	The Accidents & Emergency Department at the King Khalid National Guard Hospital (KKNGH)	Prospective collection of data from medical records over one year period.	43 children aged 10 years and less out of 361 patients aged up to 50 years.	Morbidity and Mortality, injury caused by road traffic crashes.	* Pedestrians' children were at risk of RTCs, with head the most common site of the body to be affected. * Set belt was not used by all occupant children who get injured.

Continued .....

Saudi Arabia					
Authors name & Study Ref.	Setting	Design	Subjects	Injury outcome	Results
Shaheen MA et al. (1990) (60)	Riyadh Central Hospital	Retrospective analysis of medical records over one year period.	A total of 4,230 patients aged 0 to 80 years.	Morbidity, fractures injuries.	* 31.8 % of children who aged 15 years and less were diagnosed with fracture. * The majority of the fracture was related to non-road RTCs. * In children 8% of the fractures were due to RTCs.
Jamal YS et al. (1990) (97)	Burns Unit at King Fahd Hospital	Prospective collection of data from medical records over a two year period.	197 children ≤ 18 years.	Morbidity and Mortality. Admitted burn: the burn that covered more than 10% of the estimated body surface area of burn (EBSA).	* Scald and flame were the main causes of burn in the children. * The majority of burn cases were occurred at home. * Injuries cases increased in the following times: the afternoon, weekend and autumn mainly September.
Sadat-Ali M et al. (1985) (100)	Accident and emergency treatment unit at King Fahd University Hospital	Prospective collection of data based on interview over one year period.	846 patients aged 7 to 44 years.	Morbidity, sport injuries.	Persons aged 20 years and less were found at high risk to sustained sport injury, mainly during soccer games.
Sudan					
Doumi BA et al. (1994) (62)	Khartoum North Teaching Hospital	Prospective collection of data using a standard sheet over a 6 month period.	231 children aged less than 15 years.	Morbidity. Patients were included in the study after a radiological confirmation of the fracture.	Of the injured children, * 82% were medically treated. * 18% were initially taken to the local healers. * 84% of the fractures resulted from sports, domestic injuries and falls. * Only 16% of the fractures were caused by RTCs mainly for the pedestrian.
Syria					
Marcenes W et al. (1999) (63)	Public and private primary schools in Damascus	Cross- sectional survey.	Randomly selected 101 school children aged 9 to 12 years.	Morbidity, incisor injuries.	* The leading causes of incisor injuries in school children in Damascus were: violence (42.5%), RTCs (24.1%), collision with people and inanimate objects (16.0%) and falls (9.1%). * There was no difference detected between boys and girls who reported having incisor injuries.

Continued .....

Tunis					
Authors name & Study Ref.	Setting	Design	Subjects	Injury outcome	Results
Ghribi F et al. (2003) (83)	Regional Hospital of Jbeniana	A prospective study on injured children who attended the hospital over the period May 2000 to April 2001.	324 children aged ≤ 14 years.	Morbidity. Injury definition was not reported.	* Falls was frequently occurred in the children (38%).
Rekik A et al. (1989) (104)	Sfax Medical Centre	Cross-sectional study based on retrospective collecting of injury data from the medical records.	2,108 children aged 0 to 14 years.	Morbidity and mortality. Injury definition was not reported.	* 7% of the accidents were caused by Scorpion bites. * 35% of mortality was caused by Scorpion bites.
United Arab Emirates					
Eid HO et al. (2007) (106)	Al-Ain Hospital, United Arab Emirates	A prospective study on patients attended the hospital over the period October 2001 to January 2003.	200 patients aged 2 to 30 years.	Morbidity and mortality. Bicycle-related injuries.	* Fall from bicycle was the major cause of injury (81.5%). * Injuries sustained to the lower limbs were common (44%)
Nawaz A et al. (2005) (74)	Department of Surgery, Tawam Hospital	Retrospective analysis of medical records over a 10 year period.	78 children aged 4 to 15 years.	Morbidity, camel related injuries.	* Fall was the main cause of injury in the children. * Head injuries were predominant in the children with multiple fractures.
Bener A et al. (1998) (64)	**Mortality:** Preventive Medicine Department in Al-Ain. **Morbidity:** Al-Ain Hospital Emergency Room	Retrospective analysis of medical records over a 5 year period.	301 children aged 0 to 14 years died after accidents. And 17,498 injured children aged 0 to 14 years.	Morbidity and Mortality. Injury definition was not reported	* RTCs were the main cause of mortality in children aged 0 to 14 years. * Head was the frequent site of the body being injured. * The leading cause of injury morbidity was contusion. * In children less than 5 years were: burns (64%), fall (41.1%) and blunt (38.7%). * RTCs were the leading cause of injury morbidity in children aged 5 to 9 and 10 to 14 years. * The occurrence of injury was predominance in boys rather than girls.
Bener A et al. (1997) (65)	Al-Ain Teaching Hospital	Retrospective analysis of medical records over one year.	16,518 children aged 0 to 14 years.	Morbidity. Injury definition was not reported.	* The frequent cause of injury morbidity in children aged 5 years and less was: falls. * While the frequent cause of injury morbidity in children aged 5 to 9 years and 10 to 14 years was RTCs. * Home was the common place of injury occurrence in children aged 5 years and less.

Table 2.3 Summary of specific articles* that investigated injury mortality and morbidity in children

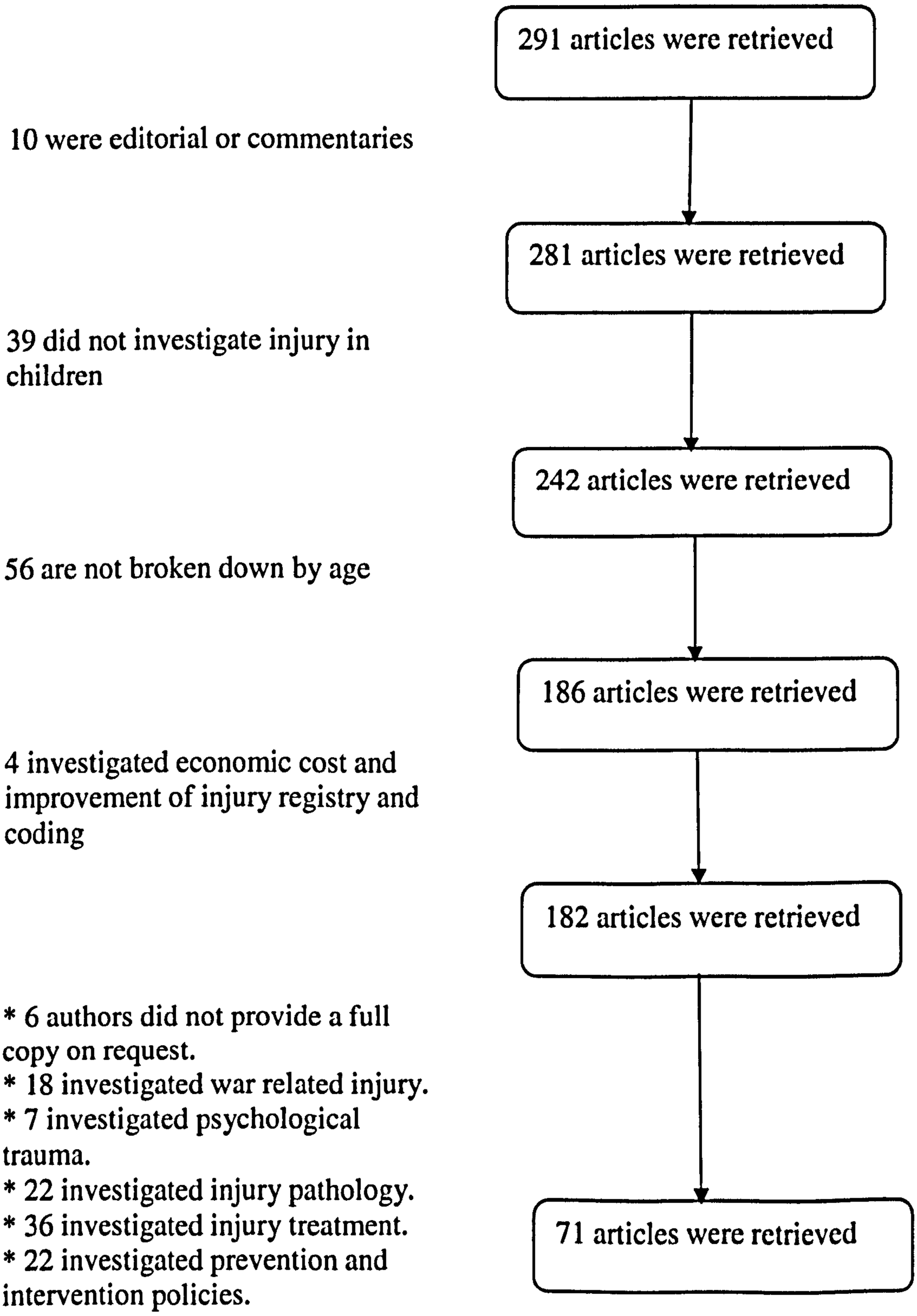
Study ref.	Country	Population	Age (years)	Main outcome	RTCs (%)[§]	Burns (%)[§]	Falls (%)[§]	Other injuries**[§] (%)
Soori H et al. (1999) (40)	Iran[#]	11,058 all deaths while from injury it was 5,213. While that in children aged 0-14 years was: 1,832.	0-65+	Mortality	687 (37.5%)	221 (12.1%)	187 (10.2%)	737 (40.2%)
Gofin R et al. (2002) (42)	Israel	110,959[Ω] total number of children who admitted due to any cause of injury.	0-17	Morbidity	16,281 (14.7%)	2,869 (2.5%)	45,804 (41.2%)	46,005 (41.5%)
Gofin R et al. (1991) (43)	Israel	Total number of target population=3,760. While the total number of children admitted to the hospital were=303[¥].	0-17	Morbidity (hospital admission)	58 (19.1%)	25 (8.3%)	90 (29.7%)	130 (42.9%)
Gofin R et al. (1989) (46)	Israel	Total number of sampled children=123,630. Total number of injuries=9,980.	0-17	Morbidity	668 (6.7%)	448 (4.5%)	4,764 (47.7%)	4,100 (41.1%)
Razzak JA et al. (2004) (55)	Pakistan	Total number of injury cases=1,320.	0-15	Morbidity and mortality	1,059 (80.2%)	64 (4.8%)	67 (5.2%)	130 (9.8%)
Marcenes W et al. (1999) (63)	Syria	Total number of injury cases=101.	9-12	Morbidity	21 (20.8%)		8 (7.9%)	72 (71.3%)
Bener A et al. (1998) (64)	United Arab Emirates	Total number of injury cases=301.	0-14	Mortality	196 (65%)	24 (8.0%)	5 (1.7%)	76 (25.3%)
Al-Ghamdi AS. (2002) (66)	Saudi Arabia[#]	Total number of injury cases=638	0-50+	Mortality	272 (42.6%)			

Continued .....

Study ref.	Country	Population	Age (years)	Main outcome	RTCs (%)[¶]	Burns (%)[¶]	Falls (%)[¶]	Other injuries**[§] (%)
Kamel MI et al. (1999) (81)	Egypt	Total number of injury cases= 3,422.	5-24	Morbidity	406 (11.8%)		1,683 (49.2%)	1,333 (39.0%)
Bang RL et al. (1997) (90)	Kuwait	Total number of patients, all ages, admitted to the burn unit with burn was= 1,125.[∞]	0-12	Morbidity		560 (49.8%)		
Bang RL et al. (2000) (91)	Kuwait[#]	Total number of patients died from burn= 234. Total number of children, aged 0-15 years, died from burn= 49.	0-65+	Mortality		49 (20.9%)		
Khan N et al. (2006) (98)	Pakistan	Total number of patients admitted with burn injury was=111.	0-10	Morbidity		42 (37.8%)		

* Presenting of these articles was based at the following characteristics:
1- At least one of the causes is of 20% or more.
2- The authors clearly defined injury in these articles.
3- Thought to have a representative sample.
** The proportions of injury in the table do not necessary sum to 100%.
[#] investigating of injury was not limited to child population.
[§] These percentages were obtained by dividing the number of event resulted from each cause (nominator) by the total number of events resulted from all the causes in each population (denominator)*100%.
[Ω] This number was obtained by totalling the number of events resulted from all injury causes and then used as the denominator to calculate the percentage in this population.
[¶] This number presents the children who only admitted to the hospital but not all the children who visited the ER.
[∞] This number reflects the total number of patients who admitted to the burn unit. However, the number of children who admitted to the burn unit was 560.

Figure 2.1 Flow chart of the search strategy



CHAPTER 3

Injury mortality in children in the Palestinian Territory

In this chapter I will describe the results of mortality analyses in children in the Palestinian territory that I undertake using data given to me by the relevant bodies. In addition, this chapter presents an investigation of whether the causes of injury among children in other countries are similar to those among Palestinian children based on an analysis of mortality data from Israel and England & Wales.

3.1 Methods

3.1.1 Palestinian data

Data on child injury deaths were obtained from the Palestinian Health Information Centre (PHIC) located in the Gaza Strip. The data include the Palestinian children who are living in the West Bank and Gaza Strip. Mortality data are provided to the PHIC from the Gaza Strip and West Bank separately, which then are joined in one database at the PHIC.

The death notifications in each of the Gaza Strip districts (North Gaza, Gaza City, Midzone and Khanyounis) are collected in the main health centre in each of these areas. These notifications are then sent to the main health centre in Gaza city, where they are categorized according to the areas and places of deaths. A death certificate is produced, and a copy is sent to the PHIC. In PHIC, a trained person (with an MPH degree) codes the data according to the WHO International Classification of Disease version 10 (ICD-10) (109).

In the West Bank, all death notifications from the branch offices of the Ministry of Interior, located in each city of the West Bank (Hebron, Bethlehem, Abudeis, Jericho, Ramallah, Jenin, Tulkarem and Qalqeliah) are delivered to the health directorate in Nablus. Here they are collected and coded, using WHO ICD-10, by a physician in the directorate and sent to the PHIC in the Gaza Strip. The data obtained from PHIC were grouped according to standard age groups: 0-4, 5-9 and 10-14 years. The total numbers

of children in the population for the years 2001, 2002 and 2003 were provided by age and gender with the injury data.

3.1.2 Israeli data

The general process to collect and code Israeli mortality is as follows. The population registration legislation of 1965 requires that the medical person in charge of the institution in which the death took place, (i.e. the physician) is to notify the Ministry of Interior within 48 hours of the death. A copy of the death notification is sent by the Ministry of Interior to the Israeli Central Bureau of Statistics (ICBS) where it is classified and coded according to ICD-10. I contacted the ICBS asking for these data. Data on injury among Israeli children were only available for the years 2000, 2001 and 2003, but not for the year 2002.

3.1.3 England & Wales data

Data on deaths of children and young adults in England and Wales for the years 2001, 2002 and 2003 were already available at London School of Hygiene and Tropical Medicine (LSHTM), as part of a separate study. The LSHTM obtained these data from the Office for National Statistics (ONS). This office derived the mortality data from the registration of deaths in which 75% of all deaths are certified by medical doctors and the rest by coroners (110). These data were classified according to ICD-10, implemented for coding cause of death in England and Wales in January 2001.

3.1.4 Analysis

Annual mortality rates by age group and gender, in the Palestinian territory and Israel, were estimated using the total number of injury deaths over the three years divided by the estimated child population over the same period. A similar calculation was used to estimate the injury rate by area (West Bank and Gaza Strip) in the Palestinian territory. In England and Wales the injury cases were totalled and divided by 100,000 of the total number of child population at the year 2001, and then the estimated rates were divided by three to obtain the annual injury rate. Since the injury events occurred over a fixed time interval (three years), the Poisson distribution was used to estimate mortality rates and to estimate 95% Confidence intervals by using the STATA command "cii" (111).

Poisson regression was used to investigate whether age group, gender and region were associated with injury deaths. In the analysis of factors associated with injury mortality boys, children aged (0-4) years and the Gaza Strip were considered as the referent groups.

In order to adjust for differences in the age distribution for children in the Palestinian territory, England & Wales and Israel, the indirect standardization technique was used. For this, injury mortality rates among children in England & Wales were considered as the standard, and were applied to the individual age years for Palestinian children aged up to 4 years, and then after that for standard age groups 5-9 and 10-14 years. For Israeli children, the estimated Standardised Mortality Ratio (SMR) was obtained by applying the injury mortality rates among children in England and Wales to the Israeli child population provided as a standard age group. The results, expected numbers of injury deaths, were then totalled. In order to obtain the standard injury mortality ratio percent (SMR%), the observed deaths were divided by the expected deaths and then multiplied by 100 (112).

3.2 Results

3.2.1 Injury mortality in Palestinian children

The total number of deaths in Palestinian children aged ≤ 14 years from injury over the period 2001 to 2003 was 589, with an estimated rate and 95% confidence interval of 12.1 (11.2 to 13.1) deaths per 100,000 children. The leading cause of injury deaths in children was due to road traffic crashes (RTCs), with an estimated rate of 4.2 (3.7 to 4.8) (Table 3.1). The second leading cause of injury deaths in children was due to firearm missiles, with an estimated rate of 3.9 (3.4 to 4.5). Drowning was the third leading cause of injury deaths in children, with estimated rate of 1.5 (1.2 to 1.9), followed by falls with estimated rate of 1.4 (1.1 to 1.8) (Table 3.1).

As shown by table 3.2, more boys than girls died from injury. Death rates due to RTCs, falls, firearm missiles and drowning were predominant in boys compared to girls with estimated rates of 5.5 (4.6 to 6.5), 1.6 (1.1 to 2.2), 5.8 (5.0 to 6.8) and 1.8 (1.4 to 2.5) respectively in boys and 2.9 (2.2 to 3.6), 1.1 (0.74 to 1.6), 1.9 (1.4 to 2.5) and 1.1 (0.71

to 1.6) respectively in girls. On the other hand, deaths caused by smoke, fire or flames were predominant in girls rather than in boys with an estimated rate of 0.33 (0.14 to 0.66) in girls and 0.08 (0.01 to 0.29) in boys. As indicated by table 3.3, children aged ≤ 14 years who had lived in the Gaza strip suffered more injury deaths than children who lived in the West Bank. Death rates caused by RTCs, falls and firearm missiles were higher in children who lived in the Gaza Strip with estimated rates of 5.9 (4.9 to 7.2), 2.2 (1.6 to 3.0) and 4.9 (3.9 to 6.0) respectively compared to that in the West Bank with estimated rates of 3.1 (2.5 to 3.8), 0.84 (0.54 to 1.2) and 3.2 (2.6 to 3.9) respectively.

3.2.2 Factors associated with injury mortality in children in the West Bank and Gaza Strip

Using Poisson regression to investigate whether age group, gender and region were associated with injury deaths I found evidence for differences between the overall injury mortality rate with children aged 5-9 years compared to children aged 0-4 years with an Incidence Rate Ratio (IRR) and 95% confidence interval of 0.80 (0.65 to 0.97). However, no evidence in differences between the injury mortality rate in children aged 0-4 years and children aged 10-14 years was observed (Table 3.1). When investigated by specific cause of death, the results revealed that the mortality rate due to RTCs in children aged 10-14 years was almost one third that in children aged 0-4 years, IRR= 0.38 (0.25 to 0.58). Mortality rates due to falls were lower in children aged 5-9 and 10-14 years, IRR= 0.58 (0.34 to 1.00) and 0.24 (0.11 to 0.54) respectively, relative to the children aged 0-4 years (Table 3.1). In addition, mortality rate due to firearm missiles in children aged 10-14 was 6 times higher than in children aged 0-4 years, IRR=6.0 (4.0 to 9.2) (Table 3.1). Mortality rates due to drowning in children aged 5-9 and 10-14 years were substantially lower than in children aged 0-4 years, IRR= 0.28 (0.15 to 0.53) and 0.28 (0.14 to 0.55) respectively (Table 3.1).

Further differences were indicated between injury mortality and gender. The overall injury mortality rate in girls was half that of boys with a rate ratio of 0.51 (0.43 to 0.60) (Table 3.2). When the association between gender and the specific cause of death was investigated the results revealed that mortality rates due to RTCs and drowning in girls were half that of boys, IRR= 0.53 (0.39 to 0.70) and 0.58 (0.36 to 0.95) respectively

(Table 3.2). Furthermore, mortality rate due to firearm missiles in girls was one third that of boys, 0.32 (0.23 to 0.45). However, there was no evidence for differences in the mortality rate due to falls between girls and boys (Table 3.2).

Differences between injury mortality rates were also indicated by region, where the overall injury mortality rate in children from the West Bank was lower than that in children from the Gaza Strip with a rate ratio of 0.55 (0.47 to 0.65). When investigated by the specific cause of injury mortality the results revealed that mortality due to RTCs in children in the Gaza Strip was almost twice that of children in the West Bank, 1.9 (1.4 to 2.5). In addition, mortality rate due to falls in children in the Gaza Strip was twice that of children in the West Bank, 2.6 (1.6 to 4.3). An increase of 50% in death rates from firearm missiles was found in children from the Gaza Strip compared to children in the West Bank, 1.5 (1.1 to 2.0). However, there was no evidence for a difference in drowning rates between the West Bank and Gaza Strip (Table 3.3).

3.2.3 Injury mortality in Israeli children

A total of 253 children aged 14 years and less died from injury over the period 2000-2001 and 2003 with an estimated rate and 95% CI of 4.5(4.0 to 5.1) deaths per 100,000 children. The leading cause of injury mortality in children was RTCs, with estimated rate of 2.6 (2.2 to 3.1). The second leading cause of injury mortality in children aged 0-14 years was drowning, with an estimated rate of 0.45 (0.29 to 0.67), followed by assault and fire, with estimated rates of 0.18 (0.08 to 0.33) and 0.18 (0.09 to 0.33) respectively. Deaths due to RTCs were predominant in Israeli children aged 0 - 4 years with a rate of 3.0 (2.3 to 3.8). In this population, the highest rate of assault, 0.25 (0.08 to 0.59), was found in children aged 0-4 years (Table 3.4). For all causes of injury, fewer Israeli girls died from injury compared to boys with a rate ratio of 0.60 (0.46 to 0.77). This was most clearly observed for RTCs with an estimated rate of 3.2 (2.6 to 3.9) in boys compared to 2.0 (1.5 to 2.6) in girls, and a rate ratio of 0.61 (0.44 to 0.86) (Table 3.5).

3.2.4 Injury mortality in children in England & Wales

A total of 1,007 children aged ≤ 14 years in England & Wales died from injury over the period 2001 to 2003, with an average annual estimated rate and 95% CI of 3.2 (3.0 to 3.4) deaths per 100,000 children. The leading cause of injury mortality in children was RTCs with an estimated rate of 1.2 (1.1 to 1.3). The death rate due to RTCs in children aged 10-14 years was almost twice that in children aged 0-4 and that in children aged 5-9 years with an estimated rate ratio of 2.1 (1.6 to 2.7) (Table 3.6).

The second leading cause of mortality in children aged 0-14 years was poisoning with an estimated rate of 0.59 (0.51 to 0.69). Children aged 0-4 years suffered more deaths due to poisoning with an estimated rate of 1.03 (0.83 to 1.2) compared to children aged 5-9, 0.31 (0.21 to 0.44), and in children aged 10-14, 0.46 (0.36 to 0.66). Suffocation was the third leading cause of mortality in children aged 0-14 years with an estimated rate of 0.50 (0.43 to 0.56). Deaths caused by suffocation was highest in children aged 0-4 years with an estimated rate of 1.06 (0.86 to 1.2) compared to that in children aged 5-9, 0.05 (0.02 to 0.12), and in children aged 10-14, 0.40 (0.30 to 0.56) (Table 3.6).

Mortality caused by smoke, fire and flames was predominant among children aged 0-4 years with estimated rate of 0.5 (0.36 to 0.66) compared to that in children aged 5-9, 0.26 (0.17 to 0.36), and in children aged 10-14, 0.14 (0.08 to 0.23) (Table 3.6). As shown by Table 3.7, gender differences were most clearly observed for the deaths caused by RTCs. Mortality in boys was higher than in girls with estimated rates of 1.4 (1.3 to 1.6) in boys and 0.86 (0.73 to 1.03) in girls. Furthermore, the following IRRs of girls compared to boys of the leading specific cause of injury mortality in children in England and Wales highlighted this fact of gender differences: RTCs 0.59 (0.47 to 0.73), drowning 0.65 (0.40 to 1.1), smoke or fire 0.53 (0.34 to 0.82) and poisoning 0.96 (0.72 to 1.2).

3.2.5 Standardized mortality ratios

When the indirect age standardization technique was used to adjust for the differences in the age distribution between the Palestinian, Israeli and England & Wales populations, the resulting Palestinian and Israeli SMRs were 337 and 131 respectively,

suggesting considerably higher injury mortality rates in Palestinian children and a small increased SMR in Israeli children compared to children in England and Wales (Tables 3.8 & 3.9).

3.3 Summary

Gender and region were identified as risk markers for injury mortality in Palestinian children. The mortality rate due to injury in girls was almost half that in boys. Children who lived in the Gaza Strip were at higher risk of being killed by injury than children who lived in the West Bank. Across the three countries, RTCs were the most common cause of injury mortality in children aged 0-14 years. However, the age trend of deaths due to RTCs in Palestinian children was similar to that in Israeli children, whereas children aged 0-4 years were more likely to die from RTCs than the older children. The opposite trend was identified in children in England and Wales. The other causes that led to deaths in Palestinian children were firearm missiles, drowning and falls, while those in Israeli children were drowning and assaults. In children in England and Wales the main causes were RTCs, poisonings, suffocations and smoke/fire or flames. The Palestinian standardized mortality ratio showed a three fold higher injury mortality rate in the Palestinian children compared to children in England and Wales.

Table 3.1 Injury mortality among children by age group (Palestine 2001-2003)

Cause of injury	Cause group	(0-4) years Pop. (1,890,725)		(5-9) years Pop. (1,615,885)		(10-14) years Pop. (1,359,233)		(0-14) years Pop. (4,865,843)	
		N	Rate (95% CI) Per 100,000 children	N	Rate (95% CI) Per 100,000 children	N	Rate (95% CI) Per 100,000 children	N	Rate (95% CI) Per 100,000 children
RTCs	V01-V99	102	5.4 (4.4 to 6.5)	75	4.6 (3.7 to 5.8)	28	2.1 (1.0 to 3.0)	205	4.2 (3.7 to 4.8)
Rate ratio (95% CI)		1 (referent)		0.86 (0.64 to 1.16) p=0.32		0.38 (0.25 to 0.58) p<0.0001			
Falls	W00-W19	40	2.1 (1.5 to 2.8)	20	1.2 (0.8 to 2.0)	7	0.5 (0.2 to 1.0)	67	1.4 (1.1 to 1.8)
Rate ratio (95% CI)		1 (referent)		0.58 (0.34 to 1.00) p=0.05		0.24 (0.11 to 0.54) p=0.0002			
Cutting/piercing	W24-W31	3	0.16 (0.03 to 0.47)	0	NA*	0	NA	3	0.06 (0.01 to 0.18)
Firearm missile	W32-W34	26	1.4 (0.9 to 2.0)	51	3.2 (2.4 to 4.2)	112	8.2 (6.8 to 10.0)	189	3.9 (3.4 to 4.5)
Rate ratio (95% CI)		1 (referent)		2.3 (1.4 to 3.7) p= 0.0004		6.0 (4.0 to 9.2) p= 0.0001			
Drowning/ submersion	W65-W74	50	2.6 (1.9 to 3.5)	12	0.7 (0.4 to 1.3)	10	0.7 (0.4 to 1.3)	72	1.5 (1.2 to 1.9)
Rate ratio (95% CI)		1 (referent)		0.28 (0.15 to 0.53) p<0.0001		0.28 (0.14 to 0.55) p= 0.0001			
Smoke/fire, flames	X00-X09	5	0.3 (0.09 to 0.6)	2	0.1 (0.02 to 0.4)	3	0.2 (0.05 to 0.6)	10	0.2 (0.1 to 0.4)
Poisoning	X40-X49	2	0.1 (0.01 to 0.38)	0	NA	1	0.1 (0.002 to 0.4)	3	0.06 (0.01 to 0.2)

Continued.....

Cause of injury	Cause group	(0-4) years Pop. (1,890,725)		(5-9) years Pop. (1,615,885)		(10-14) years Pop. (1,359,233)		(0-14) years Pop. (4,865,843)	
		N	Rate (95% CI) Per 100,000 children	N	Rate (95% CI) Per 100,000 children	N	Rate (95% CI) Per 100,000 children	N	Rate (95% CI) Per 100,000 children
Intentional self harm	X60-X84	0	NA	0	NA	2	0.15 (0.02 to 0.5)	2	0.04 (0.005 to 0.15)
Assault	X85-Y09	3	0.2 (0.03 to 0.5)	3	0.2 (0.04 to 0.5)	2	0.15 (0.02 to 0.5)	8	0.16 (0.07 to 0.3)
Drug medicaments	Y40-Y84, Y88	0	NA	0	NA	1	0.1 (0.002 to 0.4)	1	0.02 (0.0005 to 0.12)
All other external causes	W20-W23, W25, X10-X39, X50-X59, Y10-Y39, Y89	15	0.8 (0.4 to 1.3)	5	0.31 (0.09 to 0.72)	9	0.7 (0.3 to 1.3)	29	0.6 (0.4 to 0.86)
All causes		246	13.0 (11.4 to 14.7)	168	10.4 (8.8 to 12.1)	175	12.9 (11.0 to 15.0)	589	12.1 (11.2 to 13.1)
Rate ratio		1 (referent)		0.80 (0.65 to 0.97)		0.99 (0.82 to 1.20)			
(95% CI)				p=0.024		p=0.91			

* Not applicable (N.A): Rates could not be calculated as no deaths in these cells.

Table 3.2 Injury mortality among children aged 0-14 years by gender (Palestine 2001-2003)

Cause of injury	Cause group	Boys Pop. (2,475,610)		Girls Pop. (2,390,233)		Total Pop. (4,865,843)	
		N	Rate (95% CI) Per 100,000 children	N	Rate (95% CI) Per 100,000 children	N	Rate (95% CI) Per 100,000 children
RTCs	V01-V99	136	5.5 (4.6 to 6.5)	69	2.9 (2.2 to 3.6)	205	4.2 (3.7 to 4.8)
Rate ratio (95% CI)		1 (referent)		0.53 (0.39 to 0.70) p<0.0001			
Falls	W00-W19	40	1.6 (1.1 to 2.2)	27	1.1 (0.74 to 1.6)	67	1.4 (1.1 to 1.8)
Rate ratio (95% CI)		1 (referent)		0.70 (0.43 to1.14) p=0.14			
Cutting/piercing	W24-W31	NA		3	0.12 (0.02 to 0.37)	3	0.06 (0.01 to 0.18)
Firearm missile	W32-W34	144	5.8 (5.0 to 6.8)	45	1.9 (1.4 to 2.5)	189	3.9 (3.4 to 4.5)
Rate ratio (95% CI)		1 (referent)		0.32 (0.23 to 0.45) p<0.0001			
Drowning/submersion	W65-W74	46	1.8 (1.4 to 2.5)	26	1.1 (0.71 to 1.6)	72	1.5 (1.2 to 1.9)
Rate ratio (95% CI)		1 (referent)		0.58 (0.36 to 0.95) p=0.027			
Smoke/fire, flames	X00-X09	2	0.08 (0.01 to 0.29)	8	0.33 (0.14 to 0.66)	10	0.2 (0.1 to 0.38)
Poisoning	X40-X49	2	0.08 (0.01 to 0.29)	1	0.04 (0.001 to 0.23)	3	0.06 (0.013 to 0.18)
Intentional self harm	X60-X84	1	0.04 (0.001 to 0.23)	1	0.04 (0.001 to 0.23)	2	0.04 (0.005 to 0.15)
Assault	X85-Y09	5	0.2 (0.06 to 0.47)	3	0.12 (0.026 to 0.37)	8	0.16 (0.71 to 0.32)
Drug medicaments	Y40-Y84, Y88	1	0.04 (0.001 to 0.23)	NA		1	0.02 (0.0005 to 0.12)
All other external causes	W20-W23, W25, X10-X39, X50-X59, Y10-Y39, Y89	18	0.73 (0.43 to 1.1)	11	0.46 (0.22 to 0.83)	29	0.60 (0.39 to 0.85)
Total		395	16.0 (14.4 to 17.6)	194	8.1 (7.0 to 9.3)	589	12.1 (11.1 to 13.1)
Rate ratio (95% CI)		1 (referent)		0.51 (0.43 to 0.60) p<0.0001			

Table 3.3 Injury mortality among children aged 0-14 years by region (Palestine 2001-2003)

Cause of injury	Cause Group	West Bank Pop.: 2,970,007		Gaza Strip Pop.: 1,895,836		Total 4,865,843	
		N	Rate (95% CI) Per 100,000 children	N	Rate (95% CI) Per 100,000 children	N	Rate (95% CI) Per 100,000 children
RTCs	V01-V99	92	3.1 (2.5 to 3.8)	113	5.9 (4.9 to 7.2)	205	4.2 (3.7 to 4.8)
Rate ratio (95% CI)		referent		1.9 (1.4 to 2.5) p<0.0001			
Falls	W00-W19	25	0.84 (0.54 to 1.2)	42	2.2 (1.6 to 3.0)	67	1.4 (1.1 to 1.8)
Rate ratio (95% CI)		referent		2.6 (1.6 to 4.3) p=0.0001			
Cutting/piercing	W24-W31	3	0.10 (0.02 to 0.30)	0	NA*	3	0.06 (0.01 to 0.18)
Firearm missile	W32-W34	96	3.2 (2.6 to 3.9)	93	4.9 (3.9 to 6.0)	189	3.9 (3.4 to 4.5)
Rate ratio (95% CI)		referent		1.5 (1.1 to 2.0) p=0.004			
Drowning/submersion	W65-W74	41	1.4 (1.0 to 1.9)	31	1.6 (1.1 to 2.3)	72	1.5 (1.2 to 1.9)
Rate ratio (95% CI)		referent		1.2 (0.74 to 1.9) p=0.47			
Smoke/fire, flames	X00-X09	3	0.1 (0.02 to 0.3)	7	0.37 (0.09 to 0.48)	10	0.2 (0.1 to 0.38)
Poisoning	X40-X49	1	0.03 (0.0008 to 0.19)	2	0.1 (0.008 to 0.24)	3	0.06 (0.013 to 0.18)
Intentional self harm	X60-X84	2	0.07 (0.008 to 0.24)	0	NA	2	0.04 (0.005 to 0.15)
Assault	X85-Y09	0	NA	8	0.42 (0.12 to 0.53)	8	0.16 (0.07 to 0.3)
Drug medicaments	Y40-Y84, Y88	1	0.03 (0.0008 to 0.19)	0	NA	1	0.02 (0.0005 to 0.12)
All other external causes	W20-W23, W25, X10-X39, X50-X59, Y10-Y39, Y89	10	0.34 (0.16 to 0.62)	19	1.0 (0.60 to 1.5)	29	0.59 (0.39 to 0.85)
Total		274	9.2 (8.1 to 10.3)	315	16.6 (14.3 to 18.5)	589	12.1 (11.1 to 13.1)
Rate ratio (95% CI)		referent		1.8 (1.5 to 2.1) p <0.0001			

* Not applicable (N.A)- Rates could not be calculated as no deaths in these cells.

Table 3.4 Injury mortality among children by age group (Israel 2000-2001, 2003)

Cause of injury	Cause group	(0-4) years Pop. (1,994,119)		(5-9) years Pop. (1,820,844)		(10-14) years Pop. (1,713,177)		(0-14) years Pop. (5,528,140)	
		N	Rate (95% CI) / 100,000 children	N	Rate (95% CI) / 100,000 children	N	Rate (95% CI) / 100,000 children	N	Rate (95% CI) / 100,000 children
RTCs	V01-V99	60	3.0 (2.3 to 3.8)	46	2.5 (1.8 to 3.3)	40	2.3 (1.7 to 3.2)	146	2.6 (2.2 to 3.1)
Rate ratio (95% CI)		1 (referent)		0.84 (0.57 to1.2) p=0.37		0.77 (0.52 to 1.1) p=0.21			
Falls	W00-W19	8	0.4 (0.17 to 0.8)	0	N.A*	3	0.18 (0.03 to 0.51)	11	0.2 (0.1 to 0.36)
Cutting/piercing	W24-W31	0	N.A	0	N.A	0	N.A	0	N.A
Firearm missile	W32-W34	0	N.A	0	N.A	0	N.A	0	N.A
Drowning	W65-W74	10	0.5 (0.24 to 0.92)	7	0.38 (0.16 to 0.79)	8	0.47 (0.2 to 0.92)	25	0.45 (0.29 to 0.67)
Rate ratio (95% CI)		1 (referent)		0.76 (0.3 to 2.0) p=0.59		0.93 (0.37 to 2.4) p=0.88			
Smoke/fire, flames	X00-X09	4	0.2 (0.05 to 0.51)	3	0.16 (0.03 to 0.48)	3	0.18 (0.03 to 0.51)	10	0.18 (0.09 to 0.33)
Poisoning	X40-X49	1	0.05 (0.001 to 0.3)	0	N.A	0	N.A	1	0.02 (0.0005 to 0.1)
Intentional self harm	X60-X84	0	N.A	0	N.A	7	0.41 (0.16 to 0.84)	7	0.13 (0.05 to 0.26)

Continued.....

Cause of injury	Cause group	(0-4) years Pop. (1,994,119)		(5-9) years Pop. (1,820,844)		(10-14) years Pop. (1,713,177)		(0-14) years Pop. (5,528,140)	
		N	Rate (95% CI) / 100,000 children	N	Rate (95% CI) / 100,000 children	N	Rate (95% CI) / 100,000 children	N	Rate (95% CI) / 100,000 children
Assault	X85-Y09	5	0.25 (0.08 to 0.59)	3	0.16 (0.03 to 0.48)	2	0.12 (0.01 to 0.42)	10	0.18 (0.08 to 0.33)
Rate ratio (95% CI)		1 (referent)		0.65 (0.15 to 2.7) p=0.56		0.46 (0.09 to 2.4) p=0. 43			
Drug medicaments	Y40-Y84, Y88	2	0.1 (0.01 to 0.63)	0	N.A	3	0.18 (0.03 to 0.51)	5	0.1 (0.03 to 0.21)
All other external causes	W20-W23, W35-W64, W75-W99, X10-X39, Y10-Y39, Y85-Y87, Y89-Y98,X50-X59	10	0.50 (0.23 to 0.92)	11	0.60 (0.30 to 1.0)	17	0.99 (0.57 to 1.6)	38	0.68 (0.48 to 0.94)
Rate ratio (95% CI)		1 (referent)		1.2 (0.51 to 2.8) p=0.67		1.9 (0.90 to 4.3) p=0.08			
Total		100	5.0 (4.0 to 6.1)	70	3.8 (3.0 to 4.8)	83	4.8 (3.8 to 6.0)	253	4.5 (4.0 to 5.1)
Rate ratio (95% CI)		1 (referent)		0.76 (0.56 to 1.0) p=0.08		0.96 (0.72 to1.3) p=0.81			

* Not applicable (N.A)- Rates could not be calculated as no deaths in these cells.

Table 3.5 Injury mortality among children by gender (Israel 2000-2001, 2003)

Cause of injury	Cause group	Boys Pop. (2,835,160)		Girls Pop. (2,692,980)		(0-14) years Pop. (5,528,140)	
		N	Rate (95% CI) / 100,000 children	N	Rate (95% CI) / 100,000 children	N	Rate (95% CI) / 100,000 children
RTCs	V01-V99	92	3.2 (2.6 to 3.9)	54	2.0 (1.5 to 2.6)	146	2.6 (2.2 to 3.1)
Rate ratio (95% CI)		1 (referent)		0.61 (0.44 to 0.86) p=0.004			
Falls	W00-W19	10	0.35 (0.17 to 0.65)	1	0.04 (0.0009 to 0.21)	11	0.2 (0.1 to 0.36)
Cutting/piercing	W24-W31	0	NA*	0	NA	0	NA
Firearm missile	W32-W34	0	NA	0	NA	0	NA
Drowning	W65-W74	14	0.49 (0.27 to 0.83)	11	0.41 (0.2 to 0.73)	25	0.45 (0.29 to 0.67)
Rate ratio (95% CI)		1 (referent)		0.83 (0.38 to 1.8) p=0.63			
Smoke/fire, flames	X00-X09	7	0.25 (0.1 to 0.51)	3	0.11 (0.02 to 0.33)	10	0.18 (0.09 to 0.33)
Poisoning	X40-X49	1	0.03 (0.0009 to 0.2)	0	NA	1	0.02 (0.0005 to 0.1)
Intentional self harm	X60-X84	5	0.18 (0.06 to 0.41)	2	0.07 (0.009 to 0.27)	7	0.13 (0.05 to 0.26)
Assault	X85-Y09	6	0.21 (0.07 to 0.46)	4	0.14 (0.03 to 0.38)	10	0.18 (0.08 to 0.33)
Rate ratio (95% CI)		1 (referent)		0.70 (0.20 to 2.4) p=0.58			
Drug medicaments	Y40-Y84, Y88	3	0.11 (0.02 to 0.31)	2	0.07 (0.009 to 0.27)	5	0.2 (0.03 to 0.21)
All other external causes	W20-W23, W35-W64, W75-W99, X10-X39, Y10-Y39, Y85-Y87, Y89-Y98,X50-X59	23	0.81 (0.51 to 1.2)	15	0.55 (0.31 to 0.92)	38	0.68 (0.48 to 0.94)
Rate ratio (95% CI)		1 (referent)		0.68 (0.35 to 1.3) p=0.25			
Total		161	5.6 (4.8 to 6.6)	92	3.4 (2.7 to 4.1)	253	4.5 (4.0 to 5.1)
Rate ratio (95% CI)		1 (referent)		0.60 (0.46 to 0.77) p=0.0001			

* Not applicable (N.A)- Rates could not be calculated as no deaths in these cells.

Table 3.6 Injury mortality among children by age group (England & Wales 2001-2003)

Cause of injury	Cause group	(0-4) years Pop. (3,234,179)		(5-9) years Pop. (3,466,568)		(10-14) years Pop. (3,578,690)		(0-14) years Pop. (10,279,437)	
		N	Rate (95% CI) / 100,000 children	N	Rate (95% CI) / 100,000 children	N	Rate (95% CI) / 100,000 children	N	Rate (95% CI) / 100,000 children
RTCs	V01-V99	84	0.90 (0.70 to 1.1)	88	0.83 (0.66 to 1.03)	191	1.7 (1.5 to 2.1)	363	1.2 (1.1 to 1.3)
Rate ratio (95% CI)		1 (referent)		0.97 (0.72 to 1.3) p=0.88		2.1 (1.6 to 2.7) p<0.0001			
Falls	W00-W19	17	0.18 (0.10 to 0.28)	4	0.04 (0.01 to 0.1)	15	0.14 (0.08 to 0.23)	36	0.12 (0.08 to 0.16)
Drowning	W65-W74	48	0.5 (0.37 to 0.66)	8	0.07 (0.03 to 0.15)	12	0.11 (0.05 to 0.20)	68	0.22 (0.16 to 0.28)
Rate ratio (95% CI)		1 (referent)		0.16 (0.07 to 0.33) p=0.001		0.23 (0.12 to 0.43) p=0.001			
Smoke/fire, flames	X00-X09	48	0.5 (0.36 to 0.66)	27	0.26 (0.17 to 0.36)	15	0.14 (0.08 to 0.23)	90	0.29 (0.23 to 0.36)
Rate ratio (95% CI)		1 (referent)		0.52 (0.33 to 0.84) p=0.006		0.28 (0.16 to 0.50) p=0.001			
Poisoning	Y10-Y34	99	1.03 (0.83 to 1.2)	33	0.31 (0.21 to 0.44)	52	0.46 (0.36 to 0.66)	184	0.59 (0.51 to 0.69)
Rate ratio (95% CI)		1 (referent)		0.31 (0.21 to 0.46) p=0.001		0.47 (0.34 to 0.66) p= 0.001			
Intentional self harm	X60-X84	0	NA*	0	NA	13	0.12 (0.06 to 0.20)	13	0.04 (0.02 to 0.07)

Continued.....

Cause of injury	Cause group	(0-4) years Pop. (3,234,179)		(5-9) years Pop. (3,466,568)		(10-14) years Pop. (3,578,690)		(0-14) years Pop. (10,279,437)	
		N	Rate (95% CI) / 100,000 children	N	Rate (95% CI) / 100,000 children	N	Rate (95% CI) / 100,000 children	N	Rate (95% CI) / 100,000 children
Assault	X85-Y09	18	0.18 (0.11 to 0.29)	13	0.12 (0.06 to 0.21)	5	0.04 (0.01 to 0.11)	36	0.11 (0.08 to 0.16)
Drug medicament	Y40-Y84	6	0.06 (0.02 to 0.13)	19	0.18 (0.11 to 0.28)	4	0.03 (0.01 to 0.09)	29	0.09 (0.06 to 0.13)
Suffocation	W75-W99	103	1.06 (0.86 to 1.2)	6	0.05 (0.02 to 0.12)	45	0.40 (0.30 to 0.56)	154	0.50 (0.43 to 0.56)
All other external causes	W20-W23, X58-X59, W50-W64, W33-W37, Y85-Y89, X30-X39	16	0.16 (0.09 to 0.26)	8	0.07 (0.03 to 0.15)	10	0.09 (0.04 to 0.17)	34	0.11 (0.07 to 0.15)
Total		439	4.5 (4.1 to 4.9)	206	2.0 (1.7 to 2.2)	362	3.3 (3.0 to 3.7)	1007	3.2 (3.0 to 3.4)
Rate ratio (95% CI)		1 (referent)		0.43 (0.37 to 0.51) p=0.001		0.74 (0.64 to 0.85) p=0.001			

* Not applicable (N.A)- Rates could not be calculated as no deaths in these cells.

Table 3.7 Injury mortality among children in England & Wales by gender

Cause of injury	Cause group	Boys Pop. (5,269,116)		Girls Pop. (5,010,321)		(0-14) years Pop. (10,279,437)	
		N	Rate (95% CI)/ 100,000 children	N	Rate (95% CI) /100,000 children	N	Rate (95% CI)/ 100,000 children
RTCs	V01-V99	233	1.4 (1.3 to 1.6)	130	0.86 (0.73 to 1.03)	363	1.1 (1.06 to 1.3)
Rate ratio (95% CI)		1 (referent)		0.59 (0.47 to 0.73) p=0.001			
Falls	W00-W19	24	0.15 (0.09 to 0.22)	12	0.08 (0.04 to 0.14)	36	0.11 (0.08 to 0.16)
Drowning	W65-W74	42	0.26 (0.19 to 0.36)	26	0.17 (0.11 to 0.25)	68	0.22 (0.16 to 0.28)
Rate ratio (95% CI)		1 (referent)		0.65 (0.40 to 1.1) p=0.083			
Smoke/fire, flames	X00-X09	60	0.36 (0.29 to 0.50)	30	0.20 (0.13 to 0.28)	90	0.29 (0.23 to 0.36)
Rate ratio (95% CI)		1 (referent)		0.53 (0.34 to 0.82) p=0.004			
Poisoning	Y10-Y34	96	0.60 (0.49 to 0.74)	88	0.58 (0.47 to 0.72)	184	0.59 (0.51 to 0.68)
Rate ratio (95% CI)		1 (referent)		0.96 (0.72 to 1.2) p=0.80			
Intentional self harm	X60-X84	6	0.03 (0.01 to 0.08)	7	0.04 (0.02 to 0.09)	13	0.04 (0.02 to 0.07)
Assault	X85-Y09	20	0.12 (0.07 to 0.19)	16	0.10 (0.06 to 0.17)	36	0.11 (0.08 to 0.16)
Drug medicament	Y40-Y84	14	0.08 (0.04 to 0.15)	15	0.09 (0.05 to 0.16)	29	0.09 (0.06 to 0.13)
Suffocation	W75-W99	98	0.60 (0.50 to 0.76)	56	0.36 (0.28 to 0.50)	154	0.50 (0.43 to 0.56)
All other external causes	W20-W23, X58-X59, W50-W64, W33-W37, Y85-Y89, X30-X39	26	0.16 (0.10 to 0.24)	8	0.05 (0.02 to 0.10)	34	0.11 (0.07 to 0.15)
Total		619	3.9 (3.6 to 4.2)	388	2.5 (2.3 to 2.8)	1007	3.2 (3.0 to 3.4)
Rate ratio (95% CI)		1 (referent)		0.66 (0.58 to 0.74) p=0.001			

Table 3.8 Indirect age standardization by applying England & Wales rates to the Palestinian population

Age (years)	Population	England & Wales/100,000	Expected deaths
0	304,941	8.66	26.40
1	415,212	5.52	22.91
2	401,187	3.55	14.24
3	388,374	3.49	13.55
4	377,034	2.83	10.67
5-9	1,713,819	2.07	35.47
10-14	1,458,012	3.54	51.61
Total			174.85

Palestinian Standardized Mortality Ratio= Observed deaths/Expected deaths*100= 589/174.85*100= **337**

Table 3.9 Indirect age standardization by applying England & Wales rates to the Israeli population

Age group (years)*	Population	England & Wales/100,000	Expected deaths
(0-4)	1,994,119	4.74	94.5
(5-9)	1,820,844	2.07	37.69
(10-14)	1,713,177	3.54	60.65
Total			192.84

Israeli Standardized Mortality Ratio= Observed deaths/Expected deaths*100= 253/192.84*100= **131**

* Since the Israeli population is not provided by individual year, standard rates were applied on the total population per age group.

CHAPTER 4

METHODS

4.1 Introduction to the Health Behaviour in School-Aged Children (HBSC) Survey

The Health Behaviour in School-aged Children is a cross-national study that was initiated in 1982 by three countries: England, Finland and Norway. Soon after the first survey, which was conducted in 1983/1984 in the initiated countries and also in Austria, this study was adopted by the WHO-European regional office. Since 1985/1986 this survey has been conducted every four years. Currently there are 42 countries participating in this study distributed across Europe, Canada, United States of America and Eastern Mediterranean Countries including the Palestinian Territory. The main aim of this study is to increase understanding of youths' health and well-being, health behaviours, and their social context. This aim could be achieved by exploring the association between the youth physical, emotional health, and well being with several outcomes, one of which is injury. The study therefore has the possibility of identifying both risky behaviours and those that promote health. Results of this study could be used to inform and influence policy and practice at national and international levels (46).

4.2 Study design

4.2.1 Study setting

This study was conducted in the Palestinian Territory, which is composed of the West Bank, including Jerusalem and the Gaza Strip. The Palestinian Territory is located on the western edge of the Asian continent and the eastern extremity of the Mediterranean Sea, with a geographical area of about 6,170 Km^2. The West Bank is composed of three major regions; the northern region includes Jenin, Tulkarem and Nablus, the central region includes Ramallah, Jerusalem and Bethlehem and the southern region includes Hebron. The estimated total population in the Palestinian Territory in 2004 was 3,636,195 people (91). According to the World Bank, the unemployment rate (the number of unemployment workers divided by the total civilian labour force) had been

estimated to be 39% at 2006. Poverty, the number of persons who are living on under US$ 1.6 a day, had been estimated to be 67% at the same year (113).

In the year 2004, the total number of children aged 10 to 14 and 15 to 19 years were 481,294 and 383,287 respectively. The schooling system in Palestine is in two stages: a basic stage that involves children aged of 6 to 16 years, and a secondary stage that involves children aged 17 to 18 years. The leaving age at the Palestinian schools is age 16 years. There were 2,192 schools operating in Palestine (1,661 government, 273 United Nations Relief and Works Agency for Palestine Refugees (UNRWA), and 258 private schools) with a total number of 29,815 classes (21,262 government, 5,955 UNRWA and 2,597 private). The total number of children enrolled in grades 6^{th}, 8^{th}, 10^{th} and 12^{th} in the academic year 2003/2004 was 295,511 students.

4.2.2 Study design

As a longitudinal study that follows the stages of youth development, would be very expensive, an alternative is a cross-sectional study that could be conducted to investigate the youth developmental changes. These changes would be defined as: the onset of adolescence (age 10), the physical and emotional changes (age 12) and the middle years of adolescence, when important life and career decisions are beginning (age 14). Another reason to investigate health behaviour and injury in children aged 10-14 is that adolescents in this age group have begun to develop their own friendship network that might increase the possibility of factors that might be associated with the occurrence of injury (114, 115).

4.2.3 Target population

I will start this section by describing how the target population was drawn by the HBSC-protocol. In this survey, school children aged 11, 13 and 15 years or at parallel grade to this age were to be surveyed. In addition to age criteria, the sample needed to include students of different ages but in the same grade because they had been either held back, or promoted from one grade to another. The target population was to include all types of schools, whether government, private, UNRWA or others. In addition, it was recommended that at least 95% of the eligible target population should be available

to be surveyed. On approaching the target population, the first priority was given to the basic country sample and then it was possible to over- sample subpopulations to ensure they were representative. However, these classes should be used only in the analysis undertaken within the country (92).

Although a small percent of Palestinian school children is held back in the same class, sampling these children might not be cost-effective, mainly because, in most cases, these children are split across different levels of schooling. Thus instead of choosing the target population based on age group, the decision was taken in the Palestinian survey to include the children at grades 6^{th}, 8^{th}, 10^{th} and 12^{th}. These children present the different type of schools; either government, private, or UNRWA.

4.2.4 Sample size

To represent the student population in each of the participating countries in the HBSC-survey, it was recommended that a minimum of 1,536 students should be surveyed. This sample size was obtained by assuming a design effect of 1.2, based on previous analysis of HBSC surveys. In addition, the sample size was chosen to achieve a 95% CI with ±3% of estimated prevalence (92). About 17,715 students, in the Palestinian HBSC-study, were identified in the sampling frame. Originally it was planned to sample 2000 children per grade, assuming a class size of 25 students, in each of the West Bank and Gaza Strip (i.e. 8000 children in total). To take account of the cluster sampling method, the size of the sample was inflated assuming a design effect of 2 to give the overall sample of 16,000 children.

4.2.5 Sampling methodology

A two-stage cluster sampling technique was utilised with the school as the Primary Sampling Unit (PSU). In the first stage, 405 schools were selected randomly with probability proportional to their size (size defined as number of classes in the school). A list of the schools and number of classes in each school, for the academic year 2003/2004, was obtained from the Ministry of Education. In the second stage, one class was selected at random from each school. Each of these classes was defined as cluster, where all the students in the selected class were eligible for inclusion. The aim was to

survey one class per school. However, in schools where boys and girls were studying in separate classes, two classes were selected, one for male and another for female. This resulted in a total of 481 classes being selected overall and 17,500 school students being sampled.

4.3 Survey administration

4.3.1 Data collection procedure

In March 17, 2004, the Centre of Nutrition and Health Research Institute in the Al-Quds University sent an official letter to the Ministry of Education (MOE) requesting permission for starting the HBSC study after the pilot study had been finished and the survey questionnaire had been modified. This letter included the sampling procedure for schools in the West Bank and Gaza Strip. Based on the MOE 2003-2004 statistics for schools and students, the letter included, as well, the schools selected for HBSC study according to its type (i.e. government, private, or UNRWA) with the grades 6^{th}, 8^{th}, 10^{th} and 12^{th}. Start and finish dates of data collection were clarified in this letter. In April 3, 2004 a positive reply was obtained from MOE with an offer to cooperate and support the HBSC study in the Palestinian schools through using their system to help in data collection. On April 7, 2004 a final version of the questionnaire and the time table with the guidelines were distributed by the MOE to all schools, from each directorate in the West Bank and Gaza Strip.

4.3.2 Team work

The MOE constructed two research teams to implement the survey data collection. The first team was at the level of the MOE, and the second team was at the level of each directorate. Each team was composed of the following members: planning department director at the MOE and each directorate, school health director at the MOE and in each directorate, and the social counsellor in each directorate. This team was charged with the following: to distribute and receive the questionnaire which was printed in a standard format and colour, and conduct training workshops for data collection at the Ministry and directorate levels. Each of the school counsellors were commissioned to do the following: to distribute and collect the completed questionnaires by applying the instructions provided in the data collection guidelines, read through the questionnaire to

children at the 6th grade, and submit the completed questionnaire by hand to the director of planning, or to the school health supervisor at his/her directorate.

4.3.3 Students' participation

Student's participation was voluntary, however no student refused to cooperate in the research. Written and verbal instructions reminded students of the importance of giving honest answers, not writing their names on the questionnaire to maintain confidentiality, and not talking during questionnaire completion. The approximate time for each student to complete the questionnaire was 45 minutes. The 2003/2004 Palestinian HBSC survey was approved by Al-Quds University Ethical Committee and Research Ethics Board of the Palestinian Ministry of Education.

4.4 Survey instrument

4.4.1 Introduction

The tool used in this survey was based on the international version of the HBSC questionnaire (1997/1998), (Appendix 1) (92). Throughout the survey life, the first time that injury problems were assessed was in the 1993-1994 survey. Injury items in this tool were derived from several other resources, mainly from the 1988 Child health supplement to the U.S. National Health Interview Survey (CHS-NHIS). The injury package was composed of 12 items with another 4 items presenting the violence measurements. All of these items were optional except for being bullied and experiencing injury in the year prior to the survey, which were mandatory items. Because the questionnaire investigates a varied range of behaviour and life style among the young, it is a long questionnaire; therefore the Palestinian questionnaire was split into two versions, 'A' and 'B', so as to cover all these aspects within the allowed period of data collection, 45 minutes.

In depth data about eating and dieting were gathered using form A of the questionnaire, while in depth data about injury and violence were gathered using form B of the questionnaire. The response of the student is required to only one of these two forms, either A or B. Questionnaire B was used to collect the students' responses about having injury during the year preceding the data collection. A filter question was used to

collect the students' responses about the most serious injury, i.e. the one that required medical care and needed long time be cured. The following questions were related to this serious injury: whether organized activity lead to serious injury, days lost from the school or usual activity due to serious injury, injury location, cause and nature of injury, use of safety equipment and the time of the occurrence of the serious injury. Assignment to questionnaire A or B was done using alternate allocation within each class.

Items in the questionnaire were divided into mandatory (i.e. that should be in each questionnaire applied for data collection in the participating countries) and optional (where the participating country has the right either to use or not to use these questions). These optional items help in-depth investigation of the health outcome under study. The original copy of the questionnaire is in English, thus a translation of all the terminology used in this questionnaire were applied into Arabic, the mother tongue language of the Palestinian school children. The questionnaire was then piloted after and retranslated into English as a reliability check.

4.4.2 Confidentiality

The survey instrument was anonymous. The written instructions on the cover-sheet of the questionnaire, as well as the oral explanation provided by the interviewers, ask the students not to write their names on the questionnaire. Upon completion of the questionnaire, the student was asked to drop it into a ballot box at the front of the classroom so that no one could trace it back to the individual student. A trained interviewer, the school counsellor, carried out the data collection in each school. Teachers from the sampled school were not given access to the completed questionnaires. Confidentiality of the school and classroom was also maintained. Apart from the computerized data files, information regarding school identity was held by the local research teams.

4.5 HBSC items selected

4.5.1 Injury items

An introductory text explained to students what was meant by "injury", (see section 4.5.7, page 107); then the student was asked to respond to the following questions that

investigated the occurrence of injury among children in the 12 months prior to the survey.

The first question was about any injury that the student may have had in the last 12 months preceding the survey. Injury in this question was defined as the one that needed to be treated by a doctor or a nurse. The question was:

> *During the past 12 months, how many times were you injured and had to be treated by a doctor or nurse?* Response categories were *(I was not injured in the past 12 months), (1 time), (2 times), (3 times) and (4 times or more.)*

A filter question was used to indicate the most serious injury from the previous responses, (see section 4.5.7, page 108), there were two responses to this question either (yes) or (no). The following questions were about this most serious injury: Children were asked to respond to a question about the place that their injury occurred whether at home, school, sport facility, street, commercial area, countryside, or any other places identified by the children. There was another question designed to assess the activity that the children were engaged in and that led to the occurrence of their serious injury. The student was asked to report the most related activity that lead to the occurrence of their serious injury. These activities were cycling, playing or training for sport or recreational activity, riding a skate scooter, skating, walking or running, riding or driving a car or other motor vehicle, fighting, paid or unpaid work or others. These response categories were derived from CHS-NHIS using the External Causes of Injury Codes (E-codes) based on the International Coding of Disease (ICD-9), the responses to these two items are crucial for undertaking injury prevention programs (92).

Injuries that resulted from sport and other recreational activities were measured via the following question:

> *Did this injury happen while participating in sports or other recreational activities?* Response categories were *(No) or (Yes), and if yes (was this organized activity or not organized activity?)*

The aim of measuring sport or recreational injury was evidence from other published research using the HBSC-survey data, and the increasing effort given to prevent the occurrence of such type of injury worldwide. Since for mortality data the E-code of injury does not distinguish between the occurrences of sport injury due to organized or unorganized activity, in order for an appropriate intervention policy to be applicable, it is better to distinguish between the occurrences of these two types of causes in surveys.

One of the consequences of injury is days lost from school. This was measured by the following question:

> *Did this most serious injury cause you to miss at least one full day from school or other usual activities, such as sports or lessons?* Response categories were *(Yes) or (no) if yes (how many full days did you miss?)*

To allow for more than one response, injury nature was measured via the following question:

> *What were the main results (damage to the body) of this most serious injury?*

There were 10 responses offered: *(bone was broken), (sprain), (cuts), (knocked out), (bruises), (internal injury requiring an operation), (burns), (poisoning) and (other).* In addition to the previous questions that were listed in the original version of the questionnaire, additional questions were asked in the Palestinian version. These were the year and month of the occurrence of serious injury:

> *In what year and month did this one most serious injury happen?* Response categories were (*2003)* or (*2004.*)

In addition, there was a further question that measured whether safety protective measures were used at the time the serious injury occurred. Use of seat belts either while riding in the front or back seat of a car was also measured in the Palestinian questionnaire.

4.5.2 Demographic and family size items

The associations between demographic factors and family size with the occurrence of serious injury were to be investigated. Children were asked to report their gender, either a (boy) or a (girl), the grade that they attend, either (6^{th}) or (8^{th}) or (10^{th}), the type of their schools, either (government) or (private) or (UNRWA), and the area where they do live, either the (West Bank) or (Gaza Strip). Responses to the number of siblings in home were collected by using the following question:

> *How many brothers and sisters live with you at home?* Response categories were *(only me), (one), (two), (three), (four), (five or more.)*

4.5.3 Socioeconomic status items

In the current study, to increase the reliability and validity of the socio-economic measurements, multiple indicators rather than a single indicator were used. The incorporated indicators of socio-economic status were "subjective family well off", work status (parental occupation), social status (parental education), poverty and family affluence. It is believed that health behaviours such as smoking, dieting and physical activity are directly linked to both socio-economic status and health outcomes in adults. Furthermore, there is evidence that psychological characteristics in adults such as depression and psychological stress are indirectly associated with low socio-economic status (92).

4.5.3.1 Subjective family well off

"Subjective family well off" was assessed by collecting the children's responses to the following question:

> *How well off do you think your family is?* Response categories were *(very well off), (quite well off), (average), (not very well off)* and *(not at all well off).*

Data on parental occupation and education were obtained by collecting children's responses to the following questions:

> *Does your father have a job?* Response categories were *(yes), (no, but he is looking for job), (no, he takes care of others), (don't know)* and *(don't have or don't see father).*

Does your mother have a job? Response categories were *(yes), (no, but she is looking for job), (no, she takes care of others), (don't know)* and *(don't have or don't see mother).*

What is your mother's education? Response categories were *(she did not graduate high school), (she graduated high school), (she continued studies after high school but not in the university)* and *(she studied in the university or graduated the university).*

What is your father's education? Response categories were *(he did not graduate high school), (he graduated high school), (he continued studies after high school but not in the university)* and *(he studied in the university or graduated the university).*

In this study, a shortage of food was used as a proxy for family poverty and was assessed by collecting the students' responses to the following question:

Some children go to school or bed hungry because there is not enough food at home. How often does this happen to you? Response categories were *(always), (often), (sometimes)* and *(never).*

4.5.3.2 Family Affluence Scale (FAS)

A Family Affluence Scale (FAS) was created using two indicators involving several items. The first indicator reflects material deprivation by collecting children's responses about family car ownership (a component of a deprivation index that was developed by Carstairs and Morris, 1991 (116)). The question was:

Does your family own a car, van or truck? Response categories were *(no), (yes, one)* and *(yes, two or more).*

Three items, (family holiday, computer ownership and own bedroom) were used as a summary indicator of home affluence. These questions were:

During the past 12 months, how many times did you travel away on holiday with your family? Response categories were *(not at all), (once), (twice)* and *(more than twice).*
How many computers do your family own? Response categories were *(none), (one), (two) and (more than two).*

Do you have your own bedroom for your self? Response categories were *(No)* and *(Yes).*

This third question was also a component of the Scottish deprivation index (117). The FAS was generated by using a combination of the following variables: family car ownership, bedroom occupancy, family holidays and computer ownership. A seven scores scale resulted from this combination which was categorised as follows: scores 0 to 3 indicated FAS1 (low affluence), scores 4 and 5 indicated FAS2 (middle affluence), and scores 6 and 7 indicated FAS3 (high affluence) (116, 117).

4.5.4 Subjective indicators of health

In this study, children's health was assessed using a subjective health complaints indicator which was formulated from two components: physical and mental health complaints. These complaints were introduced into the questionnaire using a standard symptom checklist (118, 119). The question was:

In the last 6 months how often have you had the following: headache, stomach ache, back ache, feeling low, irritability or bad temper, feeling nervous, difficulties in getting to sleep, feeling dizzy. Response categories were: *(About every day), (more than once a week), (about every week), (about every month), (rarely or never.)*

Children's health was assessed through collecting data about the chronic diseases that the children suffer from; these data were obtained by the following question:

Do you suffer from any of the following: asthma, diabetes, physical disabilities such as severe ear or eye impairment? Response options were *(yes), (no.)*

4.5.5 Healthy behaviours indicators

School children's physical activity was assessed using two indicators that were developed by Prochaska et al. (120). Responses about physical activity during the last seven days prior to the survey were collected using the following question:

> *Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? Please tick one box only.* Response categories were *(0 days), (1 day), (2 days), (3 days), (4 days), (5 days), (6 days) and (7 days.)*

The second indicator assessed the physical activity of the children over a typical week, by collecting data using the following question:

> *Over a typical or usual week, on how many days are you physically active for a total of at least 60 minutes per day? Please tick one box only.* Response categories were *(0 days), (1 day), (2 days), (3 days), (4 days), (5 days), (6 days) and (7 days.)*

4.5.6 Risk taking behaviour indicators

4.5.6.1 Peer relationship

It is thought that children at 6th, 8th and 10th grades tend to be more influenced by their relationship with their peers than the relationship with their families, mainly due to the physical and psychological changes that children pass through at this age. These peer relationships are believed to be either protective or risky to the child's behaviour. For example, children might be involved in a peer relation that valued the risky behaviours and this will influence negatively their behaviours. In this study, children were asked to report the frequency of time that they had been in contact with their friends, the question was:

> *How many evenings per week do you usually spend out with your friends?* Response categories *were (0 evenings), (1 evening), (2 evenings), (3 evenings), (4 evenings), (5 evenings), (6 evenings) and (7 evenings.)*

4.5.6.2 Smoking

It is believed that the earlier that children start smoking, the sooner they become addicted to it, even before they go into their adulthood. These children will experience a negative health consequence as a result, for example reduced lung function. Peer pressure and stress are risk factors that believed to be associated with smoking. In this study the frequency of current smoking in children was measured by the following question:

How often do you smoke tobacco at present? Response categories were (*Every day), (at least once a week, but not every day), (less than once a week) and (I do not smoke.)*

It is thought that children who reported a regular smoking habit are at increased risk of not quitting smoking as they move into adulthood, and thus they will be more exposed to the short and long term effects from smoking.

4.5.6.3 Violence

It is crucial to investigate bullying and fighting as determinants of the occurrence of injury among the Palestinian school-aged children; mainly due to the belief that bullying and physical fighting might extend with long-term effect into adulthood. It is thought that children who are bullied might have similar aggressive behaviour in their adulthood (121). The result of longitudinal research indicates an association between the presence of anti-social behaviour in adulthood, such as criminality, and childhood bullying (121). In the similar manner victimized children are thought to be at increased risk of suffering more depression along side other side effects (122). The involvement of multiple systems, such as mental health services, social services, special education and juvenile justice, in resolving the effect of bullying and fighting add additional financial cost to the social cost. In this study, students' responses to the question of participating in physical fights during the year prior to the survey were collected by the following question:

During the past 12 months, how many times were you in a physical fight? Please tick one box only. Response categories were (*I have not been in a physical fight), (1 time), (2 times), (3 times), (4 times or more.)*

Students' responses to the question of participating in bullying other students were collected by the following question:

How often have you taken part in bullying another student (s) at school in the past couple of months? Please tick one box only. Response *categories* were *(I haven't bullied another student (s) at school in the past couple of months),(it has only happened once or twice),(2 or 3 times a month), (about once a week), (several times a week.)*

4.5.6.4 Additional risk taking behaviours

Additional risk taking behaviour indicators were investigated in the Palestinian study of health behaviour among school-aged children. These indicators were: using a seat belt while travelling in the front and back seat of a car, wearing a bicycle helmet, and carrying a weapon. Students' responses to using a seat belt while travelling in the front of a car were collected using the following question:

> *How often do you buckle up your seat belt when you ride in the front seat of a car?* Response categories were *(Always), (frequently), (sometimes), (seldom or never), (there are no seat belts in the car I usually ride in), and (I never travel by a car.)*

Students' responses to seat belt use while travelling in the back of a car were collected using the following question:

> *How often do you buckle up your seat belt when you ride in the back seat of a car?* Response categories were *always, frequently, sometimes, seldom or never, there are no seat belts in the back seat of the car I usually ride in, I never travel by a car.*

Students' responses to helmet use while cycling were collected using the following question:

> *How often do you wear a helmet when you ride a bicycle?* Response categories were (*I didn't ride a bicycle during the past 12 months), (always), (frequently), (sometimes) and (seldom or never.)*

Students reported the number of times that they carried a weapon during the last month prior to the survey by answering the following question:

> *During the past 30 days, on how many days did you carry a weapon, such as a knife, club or other objects*? Response categories were (*I did not carry a weapon during the past 30 days), (1 day), (2 to 3 days), (4 to 5 days) and (6 or more days.*)

4.5.7 Definitions of terms

"The questions about injury were introduced in the questionnaire with short paragraphs, as follows: *Many young people get hurt or injured from activities such as playing sports*

or fighting with others at different places such as the street or home. Injuries can include being poisoned or burned. Injuries do not include illnesses such as Measles or Flu."

Serious injury: the one injury that takes a long time to get better, this injury is identified by mode of treatment and days lost from schools or other usual activities, such as sports or lessons (92).

Physical fighting: *"When two students of about the same strength or power argue or fight (92)."*

Bullying: *"When another student, or a group of students, say or do nasty and unpleasant things to him or her. It is also bullying when a student is teased repeatedly in a way he or she does not like or when they deliberately left out of things (92)."*

Physical activity: *"is any activity that increases your heart rate and makes you get out of breath some of the time. Physical activity can be done in sports, playing with friends, or walking to school. Some examples of physical activity are running, brisk walking, rollerblading, biking, dancing, skateboarding, swimming, soccer, basketball, football and surfing. Physical activity does not include education or gym class(es) (92)."*

4.6 Pilot study

A pilot study was conducted with the aim of building capacity to carry out data collection in different schools' systems, and to train research staff in managing this type of data collection and data entry. Through this pre-test, the survey questionnaire was translated into Arabic and administrated to school-children in several classrooms.

4.6.1 Focus group discussion

In order to identify culture-specific topics of priority to be added to the HBSC survey instrument to meet local needs, focus group discussions were conducted. School-children were encouraged by the research team to discuss central issues that the children believed would affect their daily well-being and safety, and to identify local patterns of health behaviours and risk taking that are common among the youth culture. The focus groups were composed of students attending 6^{th}, 8^{th}, 10^{th} and 12^{th} grades in governmental, UNRWA, and private schools. A total of six focus group discussions were held; three for boys and three for girls. Seven to ten randomly selected children were chosen to participate in the focus group discussion, and overall 45 school-children

participated. Most of the issues that were identified by the school-children (either to be added or deleted) were culturally oriented, for example, for the reasons of school dropout the students suggested to add "under-age marriage", since Palestinian girls married as early as at the age of 13 years. A variety of topics were outlined by the school-children who participated in the focus group to be deleted from the local questionnaire. These topics were: access to sport facilities, verbal violence of teachers, domestic violence. However, the expert panel that was conducted to discuss the focus group results suggested not deleting these items, mainly because they believed that measuring these items would be useful to this survey.

4.6.2 Pilot administration of the questionnaire

To check the acceptability and understanding of the measures added to the local instrument, and to develop a sampling strategy for a representative sample of school-children attending 6^{th},8^{th},10^{th} and 12^{th} grades in governmental, UNRWA and private schools in the West Bank and Gaza Strip, a pilot administration of the questionnaire, in its two parts A and B, was given to a sample of school children. For this, children attending 6^{th}, 8^{th}, 10^{th} and 12^{th} grades were to be targeted. In each sampled school, one class room in each relevant grade level was selected at random. In schools where boys and girls studied in separate classrooms, two classrooms were selected, one for each gender. All the students in the sampled classrooms were eligible to participate in the pilot study. The pilot sample included 4 classrooms in each of the 4 grade levels (total 16 classrooms) with approximately 30 to 45 students per classroom. The total respondents were 600 students selected from an adolescent school that was not included in the final sample.

4.7 My role in this study

I was employed as an administrative assistant on the HBSC survey, where I was responsible for the overall supervision of the survey in 16 schools. I was given permission to use the HBSC survey data for the purpose of this thesis by the Principal Investigator of the Palestinian HBSC survey (Dr. Ziad Abdeen). In order to prepare the data for analysis it was first necessary to clarify the sampling methods used (which I did

with the help from Tom Marshall). I also undertook additional data management for the purpose of my thesis, mainly range and consistency checks.

4.8 Data management

Data were entered using the Statistical Package for Social Science (SPSS), version 11 (97). All the study questionnaires were entered by trained researchers. For data cleaning purposes 10% of questionnaires were re-entered by different trained researchers, and the post results were matched to the former one. The data provided to me were transferred from SPSS to STATA, where it was analysed.

4.8.1 Creating a new data set

Data were provided as a single data set. Since responses to the question on serious injury obtained from half of the study sample, a new data set was composed. Only variables that were essential to my analysis were included in this data set. These variables were determined based on the literature review. The provided variables were named using code, so they were changed to identified variables names. For the purpose of analysis, new variables were generated and recoded. However, some of the variables were recoded without generating a new one. Whenever the outcomes are categorical, it was changed to a binary variable with the code (0, 1) in order to be suitable for analysis in logistic regression. Inconsistencies in the data were checked and the usual procedure followed. For example, if children reported no general injury but then provided information about the most serious injury, the injury outcome variable was changed to be a positive report.

4.8.2 Introducing the survey components

To introduce the survey components into the main data set, the unique pupil identification number was split into school, grade and student identification numbers, where school is the primary sampling unit (PSU). Since classes were variable in their sizes, the data were weighted in the analysis. Probability weights were introduced into the main data set through the following steps. Two tables were composed, the first one (Table 4.1) presents the total number of school children that were surveyed by school type, grade and area. The second table (Table 4.2) presents the total number of children

that were enrolled in the school in the academic year 2003/2004 by school type, grade and area. The data presented in Table 4.2 were obtained from the Palestinian Ministry of Education. A third table (Table 4.3) was created by using a combination of Tables 4.1 and 4.2. This table was transferred from excel to STATA. A new variable "Stratum" was introduced and defined in the master file, the original data set. Finally, the survey component weight was introduced into the master file by merging the created data set and the master data set in STATA.

4.9 Strategy of analysis

4.9.1 Selection of variables

A wide range of variables is used to measure different aspects of childrens' health in the HBSC questionnaire. For the selection of variables, where its association with the occurrence of serious injury will be investigated, I based at the following sources: A report that was published by the WHO in 2006 at the title of "Child and adolescent injury prevention: A WHO plan of action, 2006-2015". Factors that were investigated in this report are briefly presented in chapter 1, [pages 31-34] (23) and include age, gender, poverty, environmental factors, and access to health care. The other source was published research from Eastern Mediterranean Countries and Israel (54, 58, 59, 70, 71, 76, 87, 95, 101, 102, 105). The factors that were investigated by these articles have already been presented in chapter 2, [pages 53-55].

In the following sections I will summarise the potential risk factors that were investigated by published research based on the HBSC survey and similar school surveys. These factors are:

1. *Wearing a bicycle helmet*: The results of a school survey conducted in South Africa revealed that the severity of injury increased when school children failed to wear a bicycle helmet (123). The results of another school survey, based on HBSC data, indicated that the risk of having serious injury in Canadian school children increased as more children reported on low parental occupation with not using a bicycle helmet. The suggested pathway for this association would be: Due to low parental occupation, the family will be at low socio-economic status, and thus buying a head helmet would not

of its priorities (124). In addition, hunger was found to be positively associated with the occurrence of injury due to physical fighting in Canadian school children (125). This association might be explained as the following: children from low socio-economic background tend to live in deprived areas where they are exposed to fighting that might increase the occurrence of injury among them.

2. *Violence related behaviour*: The results of a Canadian study, which was based on HBSC data, indicated a strong association between bullying and the occurrence of injury (126). The results of another Canadian study showed a positive association between the occurrence of injury and carrying a weapon by school children (125). A positive association between having injury and violence reported by children aged 12 to 18 years was indicated in a Fleming study (127).

3. *Socioeconomic status*: The results of several school surveys revealed significant associations between family socioeconomic status with the occurrence of injury (124, 128, 129). Family socioeconomic status has been observed to be associated with a certain type of injury as shown by a study conducted based on HBSC data: Whereas a positive association was observed between low family affluence and the prevalence of head and face injuries (124), on the other hand high family affluence was positively associated with an increased prevalence of neck and spine injuries (124).

Other studies indicated an association between the socioeconomic status of the individual with activity leading to injury. Analysis of pooled data from several HBSC surveys indicated the predominance of biking and skating injuries in children who reported that their family was "well off". Furthermore, the predominance of running and fighting injuries was observed in children who reported that their family was "not well off" (129). The results of a Canadian HBSC survey showed a positive association between higher family affluence and being injured whilst a passenger in the care (124). The possible pathway for this previous relationship is that: coming from a high affluence family could be an indicator of a higher level of car ownership and this will increase the possibility of getting injured as a car occupant.

The results of a Canadian study, which was based on HBSC data, indicated the predominance of pedestrian injuries in school children who reported on a low level of affluence (124). The following pathway might explain this previously mentioned relationship: Low family affluence might be an indicator of children living near to, and being active in a hazardous road, e.g. crossing a busy street, which increases the risk of these children in being hit by a car. Low family affluence was found to be significantly associated with the occurrence of serious injury caused by fighting (124, 130). In another HBSC study an association was indicated between high parental level of occupation and having injury at sport facilities (124, 125). The possible pathway for this association would be that: employment and higher levels of occupation might be an indicator for increasing family material wealth, and thus increased exposure to organized activities which in turn might increase the risk of getting injured in sport facilities.

The results of other studies indicated the place of injury occurrence to be associated with the socioeconomic status that was reported by the school children. Street and home injuries were found to be significantly associated with lower socioeconomic status in Canadian school children (124). In another study, a strong association was observed in the occurrence of injury at a sport facility and reporting on high socioeconomic status by school children (129). Other studies found a strong positive association between hunger and getting injured in the street in Canadian school children (125, 131).

4- *Parental education*: The results of a study that was conducted in children living in Brazil, Chile, Cuba, and Venezuela found a significant association between the head of household's education and the occurrence of home injury in children. It found that children of parents with only a primary level of education were more exposed to risk of home injury (132). In the same study, children of parents with a higher educational level were at higher risk of road traffic crashes (132). The possible pathway of this association would be: higher educational levels might be an indicator of higher socioeconomic status, which gives the possibility to greater access to motor vehicles, and this would lead to possible increases in children being injured as car occupants.

5- *Peer relation*: Peer relations may be assessed by the amount of time spent out with friends. It is believed that peer relation is an important factor that shapes the behaviours of children, because they start to formulate their own social networks. Only one study was found to investigate the association between peer relationship and the occurrence of serious injury. In this study, a strong association was found between spending time with friends and the occurrence of serious injury in Canadian children (126).

6- *Smoking*: This factor is usually associated with the effect of peers and the psychological well being of the children at this transition age. For example: smoking could be more prevalent among children of lower self-esteem, as these children are more likely to be involved in risky behaviours such as not using seat belts which would increase the possibility of being injured (126, 127, 133).

7- *Health complaints*: A strong statistical association was indicated between physical well being and the occurrence of injury in Fleming children (127). Children who reported more than three health complaints were at higher risk of injury. In the same study, a positive association was found between the occurrence of injury and the psychological well-being of the children, where children who reported having a depressive mood were at increased risk of injury (127).

4.10 Statistical methods

The data were analyzed using STATA10 (134). Univariate and multivariate methods were used to investigate the association between demographic, socio-economic, physical and mental health and risk taking behaviours factors with the occurrence of serious injury. These factors were analyzed either as binary or categorical variables. The analysis took account of the sample survey design by the use of "svy" commands in STATA, for analysis of complex surveys (134). All through the analysis, students aged 18 years were excluded, as not all children aged 18 years attend school. The missing values were also excluded from this analysis. The differences between proportions were assessed using the p-value for heterogeneity.

4.10.1 Descriptive analyses

The distribution of each variable was examined to get a good understanding of the characteristics of the study population with respect to the exposure and other variables measured. Simple cross-tabulations were carried out. Categorical variables were summarized by grouping responses appropriately and then calculating their frequency distribution. Bivariate analysis was performed to identify associations and differences, and to facilitate interpretation of the results. Associations of serious injury with the potential risk factors were assessed by the use of logistic regression. For this, children aged 12 years; male, attending governmental school and living in the West Bank were considered as the reference groups.

4.10.2 Multivariable analyses

Multivariable logistic regression (adjusted for the survey design) was used to estimate the association between serious injury and categorical explanatory variables. Odds ratios with 95% confidence intervals were obtained. First, univariate analyses were conducted through the examination of the association between serious injury and the independent variables. Then adjustment for confounders and other covariates was made through using multivariate logistic regression. The groups of variables considered were: demographic factors, socio-economic factors, social and leisure activities, individual health, and risk taking or social behaviours. Possible interactions between the exposure variables and serious injury were explored in the final model using tests for interaction. The details of the confounders and other covariates are given in the results chapter 6. Multinomial logistic regression (adjusted for the survey design) was used to investigate associations between serious injury and risk factors of interest for different locations (e.g. in the home, in the street, at school, etc.)

4.10.3 Missing values

Missing values in each of the explanatory variables and the outcome were explored to investigate its possible effects on the estimated associations. First, I looked at the level of missing responses and whether these were missing at random or selectively missed. I then carried out sensitivity analyses based on different assumptions about missing outcome data (e.g. all missing data were positive or negative for serious injury.)

Table 4.1 Distribution of total number of school children (17,715) included in the survey

	West Bank				Gaza Strip			
Grade level	6th	8th	10th	12th	6th	8th	10th	12th
Government	2,108	2,304	2,285	1,858	1,133	1,172	1,979	2,021
Private	116	137	73	155	23	73	27	32
UNRWA	262	123	23	0	1,011	800	0	0
Total	2,486	2,564	2,381	2,013	2,167	2,045	2,006	2,053

Table 4.2 Distribution of the school children population enrolled in grade 6th, 8th, 10th and 12th in the academic year 2003/2004 (295,511) students in the West Bank and Gaza Strip

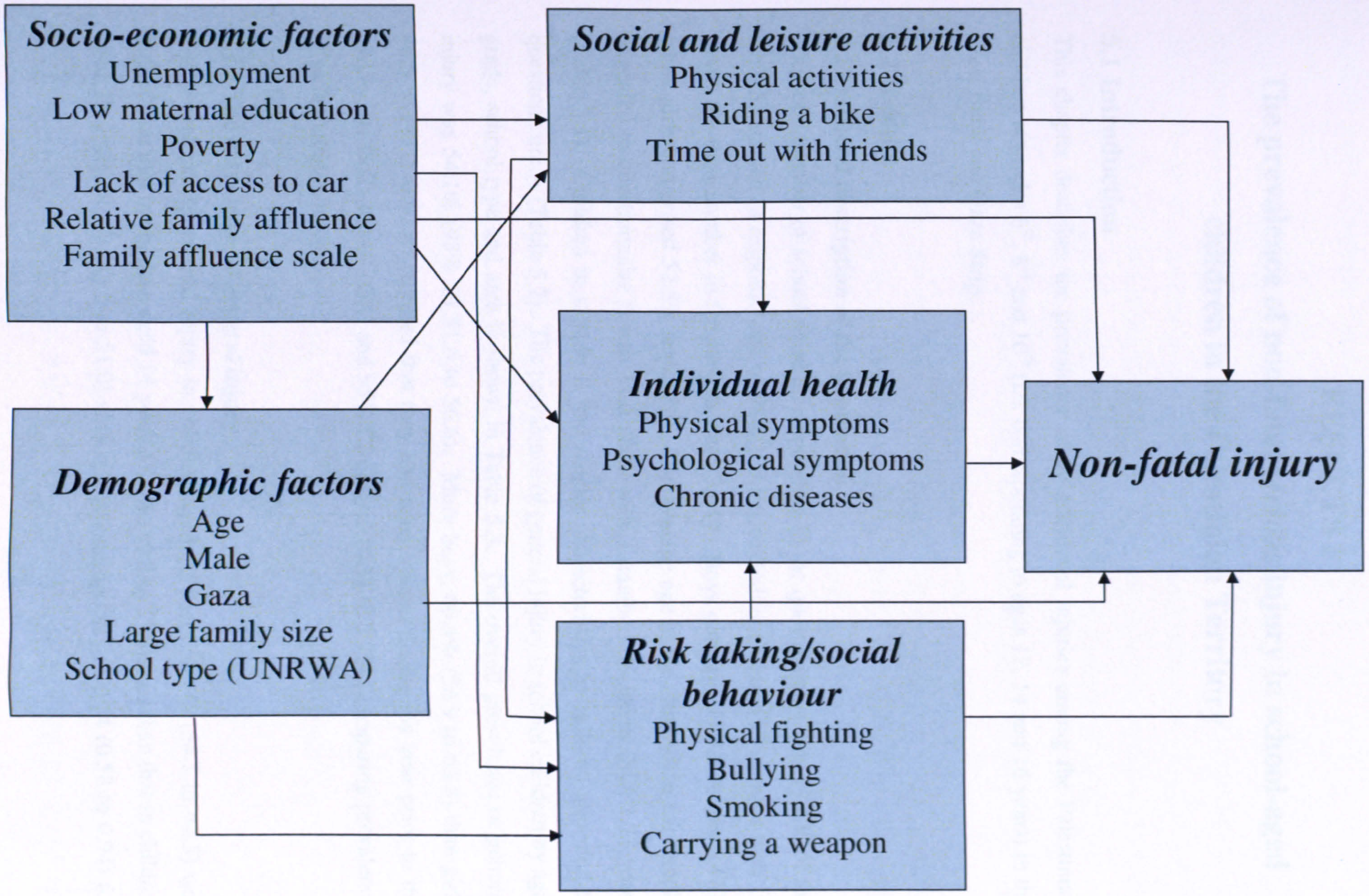
	West Bank				Gaza Strip			
Grade level	6th	8th	10th	12th	6th	8th	10th	12th
Government	45,522	41,559	38,397	25,887	16,837	15,133	26,532	18,423
Private	4,272	2,996	2,162	1,921	610	428	135	135
UNRWA	7,188	6,111	125	0	21,604	19,534	0	0
Total	56,982	50,666	40,684	27,808	39,051	35,095	26,667	18,558

Table 4.3 Probability weights*

Stratum**	Sample	Population	Weight (Wt.)
1	2,108	45,522	21.6
2	2,304	41,559	18.0
3	2,285	38,397	16.8
4	1,858	25,887	13.9
5	1,133	16,837	14.9
6	1,172	15,133	12.9
7	1,979	26,532	13.4
8	2,021	18,423	9.1
9	116	4,272	36.8
10	137	2,996	21.9
11	73	2,162	29.6
12	155	1,921	12.4
13	23	610	26.5
14	73	428	5.9
15	27	135	5.0
16	32	135	4.2
17	262	7,188	27.4
18	123	6,111	49.7
19	23	125	5.4
21	1,011	21,604	21.4
22	800	19,534	24.0

* Weights were obtained by dividing the number of individuals in the population by the number of individuals in the sample for each stratum.
** For example, stratum 1 represents children living in the West Bank, at their 6^{th} grade in governmental schools. While stratum 9 represents children living in the West Bank, at their 6^{th} grade in private schools.

Figure 4.1 Causal diagram for the expected association of potential risk factors and the occurrence of non-fatal injury



CHAPTER 5

RESULTS I

The prevalence of non-fatal serious injury in school-aged children in the Palestinian Territory

5.1 Introduction

This chapter describes the prevalence of unintentional injuries among the Palestinian children at grades 6th, 8th and 10th (i.e. corresponding to ages 12, 14 and 16 years) in the West Bank and Gaza Strip.

5.2 Results

5.2.1 General description of the population

The total number of school children responding to the questionnaire was 17,438 of the 17,715 sampled (a response rate of 98%.) After excluding children aged more than 16 years, the total number in the sample was 13,649. Boys comprised 47.5 % (n= 6,479) while girls comprised 52.5% (n=7,170). The average age of the children in the sample allocated to questionnaire B was 14.0 years with a standard deviation (SD) 1.73 years (Table 5.1). Children in sample B had similar characteristics to children allocated to questionnaire A (Table 5.2). The prevalence of general injury in school children by age, grade, school type and area is shown in Table 5.3. The overall prevalence of general injury was 54.1% (95% CI 51.6 to 56.6). More boys, 60.4% (56.9 to 63.8) than girls 48.5 % (45.2 to 51.8) reported that they had been injured during the year prior to the survey, an Odds Ratios (OR) and 95% CI of 0.62 (0.51 to 0.75) (comparing prevalence in girls to that in boys)

5.2.2 The prevalence of general injury

The prevalence of general injury in children aged 12 years 59.7% (54.7 to 64.5) was higher than that in children aged 14 years 52.4% (49.2 to 55.4), and than that in children aged 16 years 48.3% (45.5 to 51.0) with corresponding ORs of 0.74 (0.58 to 0.94) for

children aged 14 years compared to 12 years, and OR of 0.63 (0.49 to 0.79) for children aged 16 years compared to 12 years (Table 5.3).

The prevalence of general injury in children attending the (UNRWA) schools 58.9% (53.4 to 64.1) was slightly higher than that in children attending governmental schools 52.5% (49.6 to 55.3), and that in children attending private schools 57.1% (51.1 to 62.8) with ORs of 1.3 (1.0 to 1.6) for UNRWA schools compared to government schools, and 1.2 (0.92 to 1.6) for private schools compared to government schools (Table 5.3).

Children living in the West Bank reported similar rates of injury (54.9%) to children living in the Gaza Strip (53%), with ORs of 0.92 (0.76 to 1.1) (Table 5.3). The analysis presented up to here has illustrated the occurrence of general injury among the school age children according to their gender, type of the school they attend, their age and the area where they are living. In the coming sections, analyses in regard to the prevalence of serious injury and its situation and consequences will be presented.

5.2.3 The prevalence of serious injury

The overall prevalence of serious injury was 26.4 (95%CI 24.2 to 28.7). More boys, 33.4% (30.0 to 36.5) than girls, 20.1% (17.5 to 22.9) reported having a serious injury from which they were treated by cast, stitches, operation or over night hospitalization. The odds ratio for serious injury in girls compared to boys was 0.50 (0.40 to 0.62). Children aged 12 years reported the highest prevalence of serious injury 33.3% (29.2 to 37.8) than children aged 14 years 24.0% (21.3 to 26.7) and children aged 16 years 19.2% (17.1 to 21.5) (Table 5.4). Compared to children aged 12 years, the ORs for serious injury were 0.63 (0.49 to 0.80) for children aged 14 years, and 0.47 (0.37 to 0.60) for children aged 16 years ($p < 0.0001$ for both comparisons) (Table 5.4).

5.2.3.1 Serious injury during organised activity

The reporting of serious injury occurrence during organised activity was much lower in girls 8.1% (6.8 to 9.6) than in boys, 22.7% (20.3 to 25.3), with OR = 0.30 (0.24 to 0.37). The prevalence of serious injury due to organised activity was lower in children aged 16 years, 10.9% (9.2 to 13.0), compared to children aged 12 years, 18.2% (15.2 to

21.8), with OR = 0.55 (0.41 to 0.74) for 16 year olds compared to 12 year olds. There was no significant difference between the rates for children aged 12 and 14 years, with OR = 0.76 (0.56 to 1.04), p-value = 0.09 (Table 5.4).

5.2.3.2 Serious injury leading to days lost from the school or usual activity

The proportion of girls who reported losing days from school or usual activity due to serious injury was lower, 17.5% (15.4 to 19.8) compared to boys, 28.8% (26.8 to 31.0), OR = 0.52 (0.43 to 0.63). The proportion of serious injury leading to lost days from school or usual activity was similar in children aged 14 years 23.8% (21.1 to 26.8) to children aged 12 years 23.2% (20.0 to 26.8) and children aged 16 years 21.3% (19.3 to 23.4) respectively. The OR for serious injury in children aged 14 years compared to children aged 12 years was 1.0 (0.81 to 1.3) and in children aged 16 years compared to children aged 12 years the OR was 0.89 (0.71 to 1.1) (Table 5.4).

5.2.4 Injury location

As shown by Table 5.5, no difference was found in the reporting of serious injury in the home between boys and girls; these proportions were 9.6% (8.0 to 11.5) and 9.7% (8.1 to 11.5) respectively. The prevalence of serious injury in the home decreased with increasing age. The highest proportion was in children aged 12 years, 12.8% (10.5 to 15.5), followed by children aged 14 years 8.1% (6.8 to 9.6) and then in children aged 16 years 6.8% (5.7 to 8.1). The prevalence of serious injury occurrence in the home was slightly higher in children living in the West Bank, 10.3% (8.7 to 12.1) compared to children living in the Gaza Strip 8.7% (7.3 to 10.6) but the difference was not statistically significant (p= 0.21).

The prevalence of serious injury at school in girls 3.1% (2.1 to 4.4) was slightly lower than that in boys 4.6% (3.6 to 6.0) with an OR of 0.65 (0.41 to 1.0). Serious injury at school was found to decrease with increasing age, where children aged 14 and 16 years reported lower serious injury prevalence 3.4% (2.5 to 4.8), 3.0% (2.2 to 3.9) respectively than children aged 12 years 4.7% (3.2 to 6.7). The estimated ORs for serious injury at school in children aged 14 and 16 years compared to children aged 12 years were 0.73 (0.44 to 1.2) and 0.63 (0.40 to 1.0) respectively (Table 5.5).

As shown by table 5.5, a large difference in the prevalence of serious injury at a sport facility was observed in girls 0.34% (0.16 to 0.70) compared to that in boys 4.1% (3.4 to 5.0) with OR of 0.08 (0.04 to 0.17). Serious injury at a sport facility was similar in children aged 12 years, 2.5% (1.7 to 3.5) compared to that in children aged 14 years 1.8% (1.3 to 2.7) and that in children aged 16 years, 2.0% (1.3 to 2.9).

The proportion of serious injury in the street in girls 1.8% (1.3 to 2.5) was also much lower than that in boys 5.8% (4.7 to 7.3) with an OR of 0.30 (0.20 to 0.45). Serious injury in the street was lower at higher ages: 3.6% (2.7 to 4.8) in children aged 14 years, and 1.9% (1.3 to 2.8) in children aged 16 years compared to that in children aged 12 years 5.1% (3.7 to 6.8), with an OR for serious injury in children aged 16 years compared to children aged 12 years of 0.37 (0.23 to 0.60) (Table 5.5).

5.2.5 Serious injury by activity

The prevalence of serious injury due to biking was found to decline with increasing age in both boys and girls. The prevalence was higher among boys compared to girls. Girls aged 12 years reported lower serious injury due to biking 3.1% (2.1 to 4.5) compared to boys of the similar age 15.1% (12.5 to 18.1) with an OR of 0.18 (0.11 to 0.28) (Table 5.6).

As shown by Table 5.6, the proportion of serious injury caused by sport activity was lower in girls compared to that in boys. This difference was most notable in children aged 16 years, in which the prevalence of serious injury caused by sport activity in girls was 6.7% (5.3 to 8.5) compared to that in boys 21.4% (18.7 to 24.5), with an OR of 0.26 (0.19 to 0.36).

The prevalence of serious injury as a result of walking or running was found to decrease with increasing age. Across all ages, girls had a slightly higher prevalence of serious injury due to walking or running compared to boys, but the difference was not significant (Table 5.6). Across all ages, the prevalence of serious injury caused by fighting was lower in girls than in boys. The highest proportion of serious injury due to

fighting was in boys aged 14 years 6.6% (5.1 to 8.5) compared to girls at the same age 2.6 (1.8 to 3.8) with an OR of 0.38 (0.23 to 0.61) (Table 5.6).

The most common activities leading to serious injury among boys in the West Bank and Gaza Strip were similar. In both regions, significant differences were indicated between reporting of biking, sport activity and fighting by girls compared to boys. With odds ratios of 0.20 (0.13 to 0.31), 0.51 (0.40 to 0.67) and 0.50 (0.33 to 0.73) respectively in the West Bank, and with odds ratios 0.16 (0.10 to 0.27), 0.27 (0.21 to 0.36) and 0.55 (0.35 to 0.88) respectively in the Gaza Strip. In addition, a significant difference was indicated in reporting of serious injury due to walking by girls in the Gaza Strip, compared to boys with an OR of 1.6 (1.0 to 2.6). When activities leading to serious injury were tabulated against the age of the children, similar patterns of injury were identified in the West Bank and Gaza Strip, in general (Tables 5.7 and 5.8).

5.2.6 Serious injury by type

The most common serious injury in boys was: cuts or puncture 37.3% (34.1 to 40.6), fracture or dislocation 23.2% (21.0 to 25.7%), bruises 22.3% (20.1 to 24.6), burns 19.0% (17.1 to 21.1), and sprain or strain 16.8% (14.8 to 19.0). The most common five serious injuries in girls were: cuts or puncture 23.6% (20.3 to 27.4), burns 18.9% (16.6 to 21.5), bruises 13.1% (10.6 to 16.2), fracture or dislocations 11.0% (9.5 to 12.7), and sprain or strain 8.5% (7.2 to 9.9). The ORs for girls compared to boys were: Fracture or dislocation (0.41 (0.33 to 0.51)), sprain or strain (0.46 (0.37 to 0.58)), cut or puncture (0.52 (0.41 to 0.66)), knocked out (0.37 (0.28 to 0.47)), and bruises (0.53 (0.40 to 0.70)) (Table 5.9).

Inverse associations were indicated between the type of serious injury and girls' age. Table 5.9 shows that girls aged 12 years reported having the highest proportions of fracture or dislocation 13.0% (10.3 to 16.2), sprain or strain 9.1% (6.8 to 12.0), cuts or puncture 26.5% (19.7 to 34.8), and bruises 14.9% (9.5 to 22.4). For girls aged 14 years these proportions were 10.7% (8.3 to 13.6), 8.4% (6.5 to 10.8), 22.2% (18.2 to 26.8), and 13.5% (10.9 to 16.5) respectively. For girls aged 16 years the proportions were

8.2% (6.4 to 10.5), 7.7% (5.6 to 10.3), 20.7% (17.6 to 24.1), and 9.8% (7.5 to 12.6) respectively.

Similarities in the type of injury proportions were identified between children in the West Bank and Gaza Strip. In boys in the West Bank, the most common types of injury were cuts, fracture and bruises, with proportions of 36.8% (32.9 to 41.1), 23.1% (20.1 to 26.4) and 22.0% (19.1 to 25.1) respectively (Table 5.10). For boys in the Gaza Strip, they were: 38.0% (32.8 to 43.6), 23.4% (20.0 to 27.1) and 22.7 (19.5 to 26.3) respectively (Table 5.11). However, for these common types of injury, girls reported different proportions than that reported by boys in the West Bank and Gaza Strip. In addition, girls in the West Bank and Gaza Strip reported identical proportions to each other except for bruises where the prevalence in girls in the West Bank 15.8% (11.8 to 20.8) was higher than that 9.6% (7.4 to 12.4) in girls in the Gaza Strip (Tables 5.10 & 5.11).

In both regions, significant differences were indicated between the reporting of cuts, fracture and bruises by girls compared to boys, with odds ratios of 0.57 (0.42 to 0.78), 0.37 (0.28 to 0.50) and 0.67 (0.46 to 0.97) respectively in the West Bank, and with odds ratios of 0.46 (0.31 to 0.68), 0.45 (0.34 to 0.62) and 0.36 (0.26 to 0.51) respectively in the Gaza Strip. When the types of serious injury were tabulated against the age of children, similar patterns of injury were identified in the West Bank and Gaza Strip, in general (Tables 5.10 & 5.11).

5.3 Summary

A total number of 1,661 school children, 26.4% (24.2 to 28.7), reported that they sustained an injury requiring medical attention. More boys (1,015), 33.4% (30.3 to 36.5), than girls (646), 20.1% (17.6 to 22.9) with an OR of 0.50 (0.40 to 0.62), reported having a serious injury for which they were treated by cast, stitches, operation or overnight hospitalization, and needed longer time to be recovered. The proportion of general injury in children aged 12 years (59.7%) was higher than that in children aged 14 years (52.4%) and in children aged 16 years (48.3%). The prevalence of serious

injury in children attending the UNRWA schools (58.9%) was higher than that in children attending the private schools (57.1%) and governmental schools (52.5%).

The prevalence of serious injury during organized activity in boys was three fold that of girls. In both boys and girls, the prevalence of serious injury was highest in the youngest age group (12 year olds). The most common locations for serious injury reported by boys were home, street, school and sport facility. Similar locations were reported by girls with fluctuation in the estimated proportions. Furthermore, similar types of injury were reported by boys and girls, with differences in the estimated proportions. The most common types of injury reported by boys and girls were: cuts or punctures, fractures or dislocations, bruises, burns and sprain or strains.

There was no difference in the prevalence of serious injury between the West Bank (26.4% (23.5 to 29.5)), and Gaza Strip (26.4% (23.1 to 30.0)). In addition, similar patterns of serious injury by age and gender were identified in the West Bank and Gaza Strip.

Table 5.1 Characteristics of children in the injury sample (Questionnaire B) by age and gender*

Age (years)	Total number of children	Age/ mean & (SD)	Boys	Girls
12	2,226	12.0 (0.27)	1,089	1,137
14	2,292	14.0 (0.35)	1,043	1,249
16	2,209	16.0 (0.39)	1,101	1,108
Total	6,727	14.0 (1.73)	3,233	3,494

* Children who were asked about serious injury by allocation to Questionnaire B

Table 5.2 Characteristics of children by age and gender (Questionnaire A)*

Age (years)	Total number of children	Age/ mean & (SD)	Boys	Girls
12	2,427	12.0 (0.27)	1,146	1,281
14	2,317	14.0 (0.35)	1,042	1,275
16	2,178	16.0 (0.39)	1,058	1,120
Total	6,922	14.0 (1.73)	3,246	3,676

* Responses on serious injury were not collected from these children

Table 5.3 Prevalence of general injury among Palestinian school children by gender, age, school type and area

	N**	Rate	95% CI	P-value*	Odds Ratio	95% CI	P-value
Gender							
Boys	3,175	60.4	(56.9 to 63.8)	P < 0.0001	referent		
Girls	3,459	48.5	(45.2 to 51.8)		0.62	(0.51 to 0.75)	P < 0.0001
Overall	6,634	54.1	(51.6 to 56.6)				
Age (years)							
12	2,197	59.7	(54.7 to 64.5)	P =0.0003	referent		
14	2,254	52.4	(49.2 to 55.4)		0.74	(0.58 to 0.94)	P =0.015
16	2,183	48.3	(45.5 to 51.0)		0.63	(0.49 to 0.79)	P < 0.0001
School type							
Government	5,404	52.5	(49.6 to 55.3)	P = 0.04	referent		
Private	197	57.1	(51.1 to 62.8)		1.2	(0.92 to 1.6)	P = 0.17
UNRWA	1,033	58.9	(53.4 to 64.1)		1.3	(1.0 to 1.6)	P = 0.04
Area							
West Bank	3,673	54.9	(51.6 to 58.3)	P = 0.44	referent		
Gaza Strip	2,961	53.0	(49.3 to 56.7)		0.92	(0.76 to 1.1)	P = 0.44

* Chi-square test for heterogeneity in injury prevalence.
** N: Total number of children who response to this question.

Table 5.4 Prevalence of general and serious injuries from organized activities and that lead to lost days of activities*

	Gender		Age (years)		
	Boys	Girls	12th	14th	16th
	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)
General injury**					
1 time	27.1	24.2	25.5	26.0	25.3
	(25.2 to 29.2)	(22.3 to 26.3)	(22.8 to 28.4)	(23.9 to 28.1)	(23.5 to 27.2)
OR (95% CI)	referent	0.68 (0.57 to 0.82)	referent	0.85 (0.68 to 1.1)	0.77 (0.61 to 0.96)
		p<0.0001		p=0.19	p=0.025
2 times	12.9	10.7	12.9	11.6	10.4
	(11.6 to 14.4)	(9.1 to 12.6)	(10.7 to 15.3)	(10.1 to 13.3)	(9.1 to 11.8)
OR (95% CI)	referent	0.64 (0.48 to 0.83)	referent	0.76 (0.55 to 1.04)	0.63 (0.46 to 0.86)
		p=0.001		p=0.09	p=0.004
3 times	7.6	5.7	7.7	5.7	5.7
	(6.4 to 8.9)	(4.7 to 6.8)	(6.2 to 9.5)	(4.6 to 7.1)	(4.7 to 6.9)
OR (95% CI)	referent	0.57 (0.41 to 0.78)	referent	0.63 (0.43 to 0.92)	0.57 (0.40 to 0.82)
		p=0.001		p=0.02	p=0.003
4 times or more	12.8	7.9	13.6	9.0	6.8
	(10.8 to 15.3)	(6.5 to 9.3)	(10.9 to 16.7)	(7.5 to 10.8)	(5.7 to 8.1)
OR (95% CI)	referent	0.46 (0.34 to 0.64)	referent	0.56 (0.38 to 0.82)	0.39 (0.27 to 0.56)
		p<0.0001		p=0.003	p<0.0001

Continued.....

	Gender		Age (years)		
	Boys	Girls	12	14	16
	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)
Serious injury* **	33.4	20.1	33.3	24.0	19.2
	(30.3 to 36.5)	(17.5 to 22.9)	(29.2 to 37.8)	(21.3 to 26.7)	(17.1 to 21.5)
OR (95% CI)	referent	0.50 (0.40 to 0.62)	referent	0.63 (0.49 to 0.80)	0.47 (0.37 to 0.60)
		p<0.0001		p<0.0001	p<0.0001
Serious injury during organized activity	22.7	8.1	18.2	14.5	10.9
	(20.3 to 25.3)	(6.8 to 9.6)	(15.2 to 21.8)	(12.0 to 17.5)	(9.2 to 13.0)
OR (95% CI)	referent	0.30 (0.24 to 0.37)	referent	0.76 (0.56 to 1.04)	0.55 (0.41 to 0.74)
		p<0.0001		p=0.09	p<0.0001
Serious injury lead to lost days from school or usual activity	28.8	17.5	23.2	23.8	21.3
	(26.8 to 31.0)	(15.4 to 19.8)	(20.0 to 26.8)	(21.1 to 26.8)	(19.3 to 23.4)
OR (95% CI)	referent	0.52 (0.43 to 0.63)	referent	1.0 (0.81 to 1.3)	0.89 (0.71 to 1.1)
		p<0.0001		p=0.78	p=0.33
Overall serious injury	26.4	(24.2 to 28.7)			

* Numbers exclude missing values
** General injury: during the past 12 months, how many times were you injured and had to be treated by a doctor or nurse?
*** Serious injury: the injury that took the most time to get better.

Table 5.5 Prevalence of serious injury according to its location among 2,892 school children who reported having serious injury*

Injury location	Gender		Age (years)			Region	
	Boys	Girls	12	14	16	West Bank	Gaza Strip
	N**=3,129	N**=3,324	N**=2,167	N**=2,199	N**=2,087	N**=3,533	N**=2,920
	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)
Home	9.6	9.7	12.8	8.1	6.8	10.3	8.7
	(8.0 to 11.5)	(8.1 to 11.5)	(10.5 to 15.5)	(6.8 to 9.6)	(5.7 to 8.1)	(8.7 to 12.1)	(7.3 to 10.6)
OR (95% CI)	referent	1.01(0.76 to 1.3) p=0.95	referent	0.60 (0.45 to 0.80) p=0.001	0.50 (0.37 to 0.66) p<0.0001	referent	0.83 (0.63 to 1.1) p=0.21
School	4.6	3.1	4.7	3.4	3.0	4.04	3.5
	(3.6 to 6.0)	(2.1 to 4.4)	(3.2 to 6.7)	(2.5 to 4.8)	(2.2 to 3.9)	(3.1 to 5.2)	(2.4 to 5.1)
OR (95% CI)	referent	0.65 (0.41 to 1.0) p=0.07	referent	0.73 (0.44 to 1.2) p=0.22	0.63 (0.40 to 1.0) p=0.05	referent	0.87 (0.54 to 1.4) p=0.55
At sport facility	4.1	0.34	2.5	1.8	2.0	1.9	2.3
	(3.4 to 5.0)	(0.16 to 0.70)	(1.7 to 3.5)	(1.3 to 2.7)	(1.3 to 2.9)	(1.5 to 2.6)	(1.7 to 3.4)
OR (95% CI)	referent	0.08 (0.04 to 0.17) p<0.0001	referent	0.75 (0.44 to 1.3) p=0.28	0.79 (0.47 to 1.3) p=0.38	referent	1.2 (0.78 to 2.0) p=0.37
In the street	5.8	1.8	5.1	3.6	1.9	3.5	3.9
	(4.7 to 7.3)	(1.3 to 2.5)	(3.7 to 6.8)	(2.7 to 4.8)	(1.3 to 2.8)	(2.7 to 4.7)	(2.9 to 5.3)
OR (95% CI)	referent	0.30 (0.20 to 0.45) p<0.0001	referent	0.71 (0.45 to 1.1) p=0.12	0.37 (0.23 to 0.60) p<0.0001	referent	1.1 (0.73 to 1.7) p=0.61

Continued.....

Injury location	Gender		Age (years)			Region	
	Boys	Girls	12	14	16	West Bank	Gaza Strip
	N**=3,129	N**=3,324	N**=2,167	N**=2,199	N**=2,087	N**=3,533	N**=2,920
	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)
At a commercial area	1.3 (0.90 to 1.9)	0.26 (0.1 to 0.65)	0.52 (0.27 to 1.0)	0.88 (0.50 to 1.5)	0.89 (0.48 to 1.7)	0.78 (0.51 to 1.2)	0.69 (0.36 to 1.3)
OR (95% CI)	referent	0.2 (0.07 to 0.53) p=0.001	referent	1.7 (0.72 to 4.0) p=0.23	1.7 (0.70 to 4.3) p=0.24	referent	0.88 (0.41 to 1.9) p=0.75
Countryside	2.7 (2.0 to 3.8)	0.90 (0.50 to 1.6)	1.9 (1.2 to 3.3)	1.5 (1.0 to 2.2)	1.7 (1.1 to 2.4)	2.3 (1.7 to 3.1)	1.0 (0.53 to 2.1)
OR (95% CI)	referent	0.32 (0.16 to 0.62) p=0.001	referent	0.75 (0.40 to 1.4) p=0.39	0.85 (0.45 to 1.6) p=0.61	referent	0.46 (0.22 to 0.97) p=0.04
Other location	2.2 (1.7 to 3.0)	1.1 (0.71 to 1.9)	1.5 (0.86 to 2.4)	1.4 (0.90 to 2.0)	2.2 (1.6 to 3.1)	1.4 (0.98 to 2.0)	2.0 (1.4 to 2.9)
OR (95% CI)	Referent	0.52 (0.29 to 0.92) p=0.03	referent	0.93 (0.48 to 1.8) p=0.83	1.5 (0.82 to 2.9) p=0.18	referent	1.4 (0.86 to 2.4) p=0.17

* Numbers exclude missing values.
** N: Total number of children who response to this question.

Table 5.6 Prevalence of activity leading to serious injury among school children by age and gender*

Type of activity	Age=12 years		Age=14 years		Age=16 years	
	Boys	Girls	Boys	Girls	Boys	Girls
	N**=1,021	N**=1,086	N**=973	N**=1,210	N**=1,040	N**=1,065
	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)
Biking	15.1	3.1	13.6	2.8	5.5	1.1
	(12.5 to 18.1)	(2.1 to 4.5)	(11.2 to 16.4)	(2.0 to 4.1)	(4.3 to 7.1)	(0.6 to 2.0)
OR (95% CI)	referent	0.18 (0.11 to 0.28)	referent	0.19 (0.11 to 0.29)	referent	0.18 (0.09 to 0.36)
		p<0.0001		p<0.0001		p<0.0001
Sport activity	19.5	9.8	21.8	11.0	21.4	6.7
	(16.7 to 22.6)	(7.5 to 12.9)	(19.3 to 24.6)	(8.9 to 13.6)	(18.7 to 24.5)	(5.3 to 8.5)
OR (95% CI)	referent	0.45 (0.32 to 0.64)	referent	0.44 (0.33 to 0.59)	referent	0.26 (0.19 to 0.36)
		p<0.0001		p<0.0001		p<0.0001
Riding a skate scooter	1.2	2.1	0.98	0.92	0.83	0.31
	(0.70 to 2.2)	(1.1 to 4.1)	(0.51 to 1.9)	(0.52 to 1.6)	(0.41 to 1.7)	(0.10 to 0.93)
OR (95% CI)	referent	1.7 (0.69 to 4.3)	referent	0.93 (0.38 to 2.2)	referent	0.37 (0.10 to 1.4)
		p=0.24		p=0.87		p=0.14
Skating	2.5	1.2	1.7	0.76	1.1	0.53
	(1.7 to 3.7)	(0.67 to 2.3)	(0.94 to 3.0)	(0.40 to 1.4)	(0.59 to 2.1)	(0.22 to 1.3)
OR (95% CI)	referent	0.49 (0.23 to 1.1)	referent	0.44 (0.19 to 1.1)	referent	0.48 (0.16 to 1.4)
		p=0.07		p=0.07		p=0.18
Walking/running	9.5	12.1	8.6	10.2	7.1	8.4
	(7.8 to 11.4)	(8.6 to 16.8)	(6.5 to 11.4)	(7.1 to 14.5)	(5.7 to 9.0)	(6.7 to 10.5)

Continued...

Type of activity	Age=12 years		Age=14 years		Age=16 years	
	Boys N**=1,021 Rate (95% CI)	Girls N**=1,086 Rate (95% CI)	Boys N**=973 Rate (95% CI)	Girls N**=1,210 Rate (95% CI)	Boys N**=1,040 Rate (95% CI)	Girls N**=1,065 Rate (95% CI)
OR (95% CI)	referent	1.30 (0.86 to 2.0) p=0.21	referent	1.2 (0.73 to 2.0) p=0.46	referent	1.2 (0.83 to 1.7) p=0.35
Riding/driving in a car	1.9 (1.2 to 3.1)	0.72 (0.38 to 1.3)	0.91 (0.51 to 1.6)	0.72 (0.32 to 1.6)	1.2 (0.71 to 2.1)	0.55 (0.26 to 1.2)
OR (95% CI)	referent	0.37 (0.17 to 0.82) p=0.02	referent	0.79 (0.29 to 2.1) p=0.64	referent	0.45 (0.18 to 1.2) p=0.1
Fighting	4.6 (3.2 to 6.6)	2.6 1.6 to 4.0	6.6 (5.1 to 8.5)	2.6 (1.8 to 3.8)	4.8 (3.7 to 6.1)	3.2 (2.1 to 4.6)
OR (95% CI)	referent	0.54 (0.30 to 1.0) p=0.04	referent	0.38 (0.23 to 0.61) p<0.0001	referent	0.64 (0.41 to 1.02) p=0.06
Paid or unpaid work	2.9 (2.0 to 4.3)	1.6 (0.92 to 2.8)	2.5 (1.7 to 3.7)	2.0 (1.3 to 3.0)	4.5 (3.1 to 6.4)	2.6 (1.7 to 3.8)
OR (95% CI)	referent	0.55 (0.27 to 1.1) p=0.09	referent	0.78 (0.43 to 1.4) p=0.41	referent	0.56 (0.32 to 0.98) p=0.04
Other	3.7 (2.4 to 5.8)	5.4 (3.5 to 8.1)	4.9 (3.5 to 6.8)	5.9 (4.2 to 8.2)	6.6 (5.1 to 8.4)	7.2 (5.6 to 9.0)
OR (95% CI)	referent	1.5 (0.77 to 2.7) p=0.24	referent	1.2 (0.74 to 2.0) p=0.45	referent	1.1 (0.76 to 1.6) p=0.62

* Numbers excluded missing values.
** N: Total number of children who response to this question.

Table 5.7 Prevalence of activity leading to serious injury among school children in the West Bank by gender and age*

Injury cause	Gender		Age (years)		
	Boys N**=1,778 Rate (95% CI)	Girls N**=1,764 Rate (95% CI)	12 N**=1,207 Rate (95% CI)	14 N**=1,205 Rate (95% CI)	16 N**=1,130 Rate (95% CI)
Biking	12.1 (10.1 to 14.4)	2.8 (1.9 to 3.9)	10.6 (8.1 to 13.6)	7.1 (5.1 to 9.7)	3.1 (2.3 to 4.1)
OR (95% CI)	referent	0.20 (0.13 to 0.31) p<0.0001	referent	0.64 (0.41 to 1.0) p=0.05	0.27 (0.18 to 0.41) p<0.0001
Sport activity	18.1 (16.2 to 20.2)	10.3 (8.4 to 12.6)	14.6 (12.0 to 17.6)	15.1 (12.8 to 17.8)	12.8 (10.7 to 15.2)
OR (95% CI)	referent	0.51 (0.40 to 0.67) p<0.0001	referent	1.0 (0.77 to 1.4) p=0.79	0.86 (0.63 to 1.2) p=0.33
Riding a skate scooter	0.96 (0.56 to 1.7)	1.8 (1.0 to 3.1)	2.3 (1.3 to 3.8)	0.87 (0.47 to 1.6)	0.53 (0.23 to 1.2)
OR (95% CI)	referent	1.9 (0.84 to 4.2) p=0.12	referent	0.38 (0.16 to 0.87) p=0.02	0.23 (0.09 to 0.60) p=0.003
Skating	1.4 (0.97 to 2.1)	0.81 (0.42 to 1.6)	1.6 (1.0 to 2.6)	0.86 (0.46 to 1.6)	0.61 (0.27 to 1.4)
OR (95% CI)	referent	0.56 (0.26 to 1.2) p=0.14	referent	0.52 (0.24 to 1.1) p=0.09	0.37 (0.15 to 0.94) p=0.04
Walking/running	9.7 (8.5 to 11.2)	10.4 (8.2 to 13.1)	10.7 (9.0 to 12.7)	10.8 (7.3 to 15.7)	8.6 (7.1 to 10.5)
OR (95% CI)	referent	1.1 (0.80 to 1.5) p=0.65	referent	1.0 (0.62 to 1.6) p=0.97	0.78 (0.58 to 1.0) p=0.10

Continued.....

Injury cause	Gender		Age (years)		
	Boys N**=1,778 Rate (95% CI)	Girls N**=1,764 Rate (95% CI)	12 N**=1,207 Rate (95% CI)	14 N**=1,205 Rate (95% CI)	16 N**=1,130 Rate (95% CI)
Riding/driving in a car	1.7 (1.2 to 2.5)	0.51 (0.28 to 0.93)	1.3 (0.80 to 2.2)	0.85 (0.49 to 1.5)	0.98 (0.55 to 1.8)
OR (95% CI)	Referent	0.29 (0.14 to 0.60) p=0.001	referent	0.64 (0.30 to 1.4) p=0.24	0.74 (0.34 to 1.6) p=0.43
Fighting	5.3 (4.3 to 6.7)	2.7 (2.0 to 3.8)	4.1 (2.9 to 5.8)	4.2 (3.1 to 5.8)	3.7 (2.8 to 5.0)
OR (95% CI)	referent	0.50 (0.33 to 0.73) p=0.001	referent	1.0 (0.62 to 1.7) p=0.91	0.9 (0.55 to 1.5) p=0.65
Paid or unpaid work	4.1 (3.1 to 5.3)	1.8 (1.2 to 2.5)	2.6 (1.8 to 3.7)	2.6 (1.8 to 3.7)	3.6 (2.5 to 5.2)
OR (95% CI)	referent	0.42 (0.27 to 0.66) p<0.0001	referent	0.97 (0.58 to 1.6) p=0.91	1.4 (0.81 to 2.3) p=0.23
Other	5.4 (4.2 to 7.1)	6.1 (4.7 to 7.9)	5.2 (3.7 to 7.3)	5.6 (4.0 to 7.7)	6.8 (5.4 to 8.6)
OR (95% CI)	referent	1.1 (0.77 to 1.7) p=0.53	referent	1.1 (0.65 to 1.8) p=0.77	1.3 (0.85 to 2.1) p=0.20

* Numbers excluded missing values.
** N: Total number of children who response to this question.

Table 5.8 Prevalence of activity leading to serious injury among school children in the Gaza Strip by gender and age*

Injury cause	Gender		Age (years)		
	Boys N**=1,256 Rate (95% CI)	Girls N**=1,597 Rate (95% CI)	12 N**=900 Rate (95% CI)	14 N**=978 Rate (95% CI)	16 N**=975 Rate (95% CI)
Biking	10.9 (8.6 to 13.8)	2.0 (1.4 to 3.0)	6.4 (3.7 to 10.6)	7.1 (5.1 to 9.8)	3.6 (2.3 to 5.6)
OR (95% CI)	referent	0.16 (0.10 to 0.27) p<0.0001	referent	1.1 (0.58 to 2.1) p=0.71	0.54 (0.26 to 1.1) p=0.10
Sport activity	24.6 (22.1 to 27.2)	8.2 (6.6 to 10.1)	14.6 (10.8 to 19.2)	15.5 (12.5 to 19.0)	15.8 (11.8 to 20.7)
OR (95% CI)	referent	0.27 (0.21 to 0.36) p<0.0001	referent	1.1 (0.71 to 1.6) p=0.72	1.1 (0.69 to 1.8) p=0.69
Riding a skate scooter	1.2 (0.73 to 1.8)	0.52 (0.27 to 1.0)	0.72 (0.34 to 1.5)	1.0 (0.57 to 1.8)	0.62 (0.25 to 1.5)
OR (95% CI)	referent	0.43 (0.20 to 1.0) p=0.05	referent	1.4 (0.54 to 3.7) p=0.46	0.87 (0.27 to 2.8) p=0.81
Skating	2.5 (1.6 to 3.8)	0.96 (0.57 to 1.6)	2.2 (1.4 to 3.6)	1.4 (0.74 to 2.6)	1.1 (0.58 to 2.2)
OR (95% CI)	referent	0.38 (0.18 to 0.77) p=0.008	referent	0.61 (0.27 to 1.4) p=0.23	0.50 (0.22 to 1.2) p=0.11
Walking/running	6.7 (5.2 to 8.5)	10.5 (7.5 to 14.5)	11.0 (6.8 to 17.3)	8.6 (6.3 to 11.5)	6.5 (4.9 to 8.6)
OR (95% CI)	referent	1.6 (1.0 to 2.6) p=0.03	referent	0.76 (0.41 to 1.4) p=0.37	0.56 (0.31 to 1.03) p=0.06

Continued.....

Injury cause	Gender		Age (years)		
	Boys N**=1,256 Rate (95% CI)	Girls N**=1,597 Rate (95% CI)	12 N**=900 Rate (95% CI)	14 N**=978 Rate (95% CI)	16 N**=975 Rate (95% CI)
Riding/driving in a car	0.98 (0.49 to 2.0)	0.86 (0.48 to 1.5)	1.2 (0.63 to 2.4)	0.75 (0.31 to 1.7)	0.72 (0.37 to 1.4)
OR (95% CI)	referent	0.87 (0.35 to 2.1) p=0.76	referent	0.60 (0.20 to 1.8) p=0.36	0.58 (0.22 to 1.5) p=0.26
Fighting	4.9 (3.6 to 6.5)	2.8 (1.9 to 3.9)	2.6 (1.5 to 4.6)	4.1 (2.9 to 5.9)	4.4 (3.2 to 5.9)
OR (95% CI)	referent	0.55 (0.35 to 0.88) p=0.01	referent	1.6 (0.82 to 3.3) p=0.16	1.7 (0.87 to 3.3) p=0.12
Paid or unpaid work	2.1 (1.3 to 3.2)	2.3 (1.6 to 3.4)	1.7 (0.85 to 3.2)	1.8 (1.1 to 3.0)	3.4 (2.3 to 5.1)
OR (95% CI)	referent	1.1 (0.60 to 2.0) p=0.75	referent	1.1 (0.47 to 2.5) p=0.83	2.1 (0.94 to 4.6) p=0.07
Other	4.1 (3.0 to 5.7)	6.0 (4.4 to 8.0)	3.5 (2.0 to 6.1)	5.4 (3.7 to 7.9)	6.9 (5.4 to 8.7)
OR (95% CI)	referent	1.5 (0.92 to 2.3) p=0.10	referent	1.6 (0.77 to 3.2) p=0.21	2.0 (1.1 to 3.9) p=0.03

* Numbers excluded missing values.
** N: Total number of children who response to this question.

Table 5.9 Type of serious injury among school children by gender and age*

Type of injury**	Age=12 years		Age=14 years		Age=16 years		Total	
	Boys Rate (95% CI)	Girls Rate (95% CI)	Boys Rate (95% CI)	Girls Rate (95% CI)	Boys Rate (95% CI)	Girls Rate (95% CI)	Boys Rate (95% CI)	Girls Rate (95% CI)
Fracture/ dislocations	24.1 (20.1 to 28.7)	13.0 (10.3 to 16.2)	25.3 (22.4 to 28.5)	10.7 (8.3 to 13.6)	19.9 (16.7 to 23.5)	8.2 (6.4 to 10.5)	23.2 (21.0 to 25.7)	11.0 (9.5 to 12.7)
OR (95% CI)	referent	0.47 (0.32 to 0.67) p<0.0001	referent	0.35 (0.26 to 0.48) p<0.0001	referent	0.36 (0.26 to 0.51) p<0.0001	referent	0.41 (0.33 to 0.51) p<0.0001
Sprain, strain	16.5 (13.1 to 20.5)	9.1 (6.8 to 12.0)	20.2 (17.0 to 23.8)	8.4 (6.5 to 10.8)	14.3 (11.4 to 17.6)	7.7 (5.6 to 10.3)	16.8 (14.8 to 19.0)	8.5 (7.2 to 9.9)
OR (95% CI)	referent	0.51 (0.34 to 0.76) p=0. 001	referent	0.36 (0.26 to 0.51) p<0.0001	referent	0.50 (0.32 to 0.76) p=0. 001	referent	0.46 (0.37 to 0.58) p<0.0001
Cuts/punctue	38.4 (32.4 to 44.7)	26.5 (19.7 to 34.8)	41.3 (37.0 to 45.7)	22.2 (18.2 to 26.8)	32.2 (28.2 to 36.6)	20.7 (17.6 to 24.1)	37.3 (34.1 to 40.6)	23.6 (20.3 to 27.4)
OR (95% CI)	referent	0.58 (0.36 to 0.93) p=0.02	referent	0.41 (0.30 to 0.55) p<0.0001	referent	0.55 (0.42 to 0.72) p<0.0001	referent	0.52 (0.41 to 0.66) p<0.0001
Knocked out	15.1 (11.8 to 19.1)	6.9 (5.2 to 9.0)	16.6 (13.5 to 20.2)	4.8 (3.2 to 7.1)	10.1 (7.7 to 13.2)	4.8 (3.5 to 6.6)	14.1 (12.1 to 16.3)	5.7 (4.7 to 6.8)
OR (95% CI)	referent	0.42 (0.28 to 0.62) p<0.0001	referent	0.25 (0.16 to 0.41) p<0.0001	referent	0.45 (0.29 to 0.71) p=0.001	referent	0.37 (0.28 to 0.47) p<0.0001

Continued.....

Type of injury**	Age=12 years		Age=14 years		Age=16 years		Total	
	Boys Rate (95% CI)	Girls Rate (95% CI)	Boys Rate (95% CI)	Girls Rate (95% CI)	Boys Rate (95% CI)	Girls Rate (95% CI)	Boys Rate (95% CI)	Girls Rate (95% CI)
Bruises	20.5 (16.8 to 24.8)	14.9 (9.5 to 22.4)	26.7 (22.7 to 31.1)	13.5 (10.9 to 16.5)	21.1 (18.2 to 24.3)	9.8 (7.5 to 12.6)	22.3 (20.1 to 24.6)	13.1 (10.6 to 16.2)
OR (95% CI)	referent	0.68 (0.38 to 1.2) p=0.17	referent	0.43 (0.31 to 0.58) p<0.0001	referent	0.41 (0.28 to 0.57) p<0.0001	referent	0.53 (0.40 to 0.70) p<0.0001
Burns	21.6 (18.2 to 25.3)	20.0 (15.8 to 25.1)	18.5 (15.4 to 22.1)	19.8 (15.8 to 24.6)	15.6 (13.2 to 18.3)	15.9 (13.2 to 19.3)	19.0 (17.1 to 21.1)	18.9 (16.6 to 21.5)
OR (95% CI)	referent	0.91 (0.64 to 1.3) p=0.60	referent	1.1 (0.76 to 1.6) p=0.63	referent	1.0 (0.76 to 1.4) p=0.87	referent	1.0 (0.81 to 1.2) p=0.93
Poisoning	15.4 (12.1 to 19.3)	8.6 (7.0 to 10.6)	14.2 (11.4 to 17.6)	7.7 (5.1 to 11.4)	10.4 (8.1 to 13.3)	5.6 (4.2 to 7.4)	13.6 (11.8 to 15.7)	7.5 (6.3 to 9.0)
OR (95% CI)	referent	0.52 (0.36 to 0.75) p=0.001	referent	0.50 (0.30 to 0.84) p=0.008	referent	0.51 (0.33 to 0.76) p=0.002	referent	0.51 (0.40 to 0.67) p<0.0001
Other	7.9 (5.9 to 10.5)	4.6 (2.7 to 7.7)	11.0 (8.9 to 13.4)	4.6 (3.2 to 6.6)	8.1 (6.5 to 10.0)	3.4 (2.5 to 4.6)	8.8 (7.6 to 10.1)	4.3 (3.2 to 5.5)
OR (95% CI)	referent	0.56 (0.30 to 1.1) p=0.07	referent	0.39 (0.25 to 0.61) p<0.0001	referent	0.40 (0.27 to 0.60) p<0.0001	referent	0.46 (0.34 to 0.63) p<0.0001

* Numbers exclude missing values.
** Types of injury are not mutually exclusive.

Table 5.10 Type of serious injury among school children in the West Bank by grade and age*

Type of the injury**	Gender		Age (years)		
	Boys Rate (95% CI)	Girls Rate (95% CI)	12 Rate (95% CI)	14 Rate (95% CI)	16 Rate (95% CI)
Fracture/dislocations	23.1 (20.1 to 26.4)	10.1 (8.2 to 12.4)	20.0 (16.4 to 24.1)	14.8 (11.4 to 19.0)	13.4 (10.7 to 16.7)
OR (95% CI)	referent	0.37 (0.28 to 0.50) p<0.0001	referent	0.69 (0.48 to 1.02) p=0.06	0.62 (0.44 to 0.87) p=0.007
Sprain, strain	14.8 (12.8 to 17.0)	8.0 (6.3 to 9.9)	12.1 (9.7 to 14.9)	11.6 (8.9 to 14.9)	10.3 (8.1 to 13.0)
OR (95% CI)	referent	0.49 (0.37 to 0.67) p<0.0001	referent	0.96 (0.65 to 1.4) p=0.81	0.84 (0.58 to 1.2) p=0.3
Cuts/puncture	36.8 (32.9 to 41.1)	25.0 (20.7 to 30.0)	34.2 (28.4 to 40.6)	31.4 (25.4 to 37.6)	25.8 (22.6 to 29.3)
OR (95% CI)	referent	0.57 (0.42 to 0.78) p<0.0001	referent	0.87 (0.59 to 1.3) p=0.51	0.67 (0.48 to 0.92) p=0.02
Knocked out	11.5 (9.4 to 14.0)	4.8 (3.7 to 6.3)	10.2 (7.8 to 13.1)	7.4 (5.6 to 9.7)	5.8 (4.1 to 8.1)
OR (95% CI)	referent	0.39 (0.27 to 0.56) p<0.0001	referent	0.70 (0.47 to 1.1) p=0.09	0.54 (0.34 to 0.86) p=0.01
Bruises	22.0 (19.1 to 25.1)	15.8 (11.8 to 20.8)	18.7 (14.0 to 24.6)	22.3 (18.5 to 26.6)	16.3 (13.6 to 19.5)
OR (95% CI)	referent	0.67 (0.46 to 0.97) p=0.04	referent	1.2 (0.81 to 1.9) p=0.31	0.85 (0.56 to 1.3) p=0.43

Continued.....

Type of injury**	Gender		Age (years)		
	Boys Rate (95% CI)	Girls Rate (95% CI)	12 Rate (95% CI)	14 Rate (95% CI)	16 Rate (95% CI)
Burns	18.7 (16.5 to 21.0)	17.3 (14.2 to 21.0)	21.8 (18.6 to 25.5)	15.4 (12.7 to 18.6)	14.2 (11.7 to 17.1)
OR (95% CI)	referent	0.91 (0.69 to 1.2) p=0.51	referent	0.65 (0.48 to 0.88) p=0.006	0.60 (0.43 to 0.80) p=0.001
Poisoning	13.0 (11.0 to 15.5)	6.8 (5.4 to 8.5)	12.5 (10.3 to 15.3)	8.4 (6.4 to 11.1)	7.1 (5.5 to 9.1)
OR (95% CI)	referent	0.49 (0.36 to 0.66) p<0.0001	referent	0.64 (0.44 to 0.94) p=0.02	0.53 (0.37 to 0.75) p=0.001
Others	8.3 (6.8 to 10.2)	4.1 (2.8 to 6.0)	6.5 (4.6 to 9.1)	6.0 (4.6 to 7.8)	5.9 (4.6 to 7.6)
OR (95% CI)	referent	0.47 (0.30 to 0.74) p=0.001	referent	0.91 (0.56 to 1.5) p=0.72	0.90 (0.57 to 1.4) p=0.66

* Numbers exclude missing values.
** Type of injury is not mutually exclusive.

Table 5.11 Type of serious injury among school children in the Gaza Strip by gender and age*

Type of injury**	**Gender**		**Age (years)**		
	Boys Rate (95% CI)	Girls Rate (95% CI)	12 Rate (95% CI)	14 Rate (95% CI)	16 Rate (95% CI)
Fracture/dislocations	23.4 (20.0 to 27.1)	12.2 (9.9 to 14.9)	16.6 (12.1 to 22.3)	19.0 (15.9 to 22.4)	16.0 (12.5 to 20.1)
OR (95% CI)	referent	0.45 (0.34 to 0.62) p<0.0001	referent	1.2 (0.77 to 1.8) p=0.45	0.96 (0.60 to 1.5) p=0.85
Sprain, strain	19.9 (16.1 to 24.3)	9.2 (7.3 to 11.5)	14.2 (9.9 to 19.8)	15.0 (12.0 to 18.7)	12.5 (9.4 to 16.3)
OR (95% CI)	referent	0.41 (0.28 to 0.58) p<0.0001	referent	1.1 (0.66 to 1.7) p=0.77	0.86 (0.53 to 1.4) p=0.55
Cuts/puncture	38.0 (32.8 to 43.6)	21.9 (16.8 to 28.0)	30.0 (21.6 to 39.7)	29.1 (24.8 to 33.7)	28.2 (23.0 to 33.9)
OR (95% CI)	referent	0.46 (0.31 to 0.68) p<0.0001	referent	0.96 (0.59 to 1.6) p=0.87	0.92 (0.55 to 1.5) p=0.74
Knocked out	18.2 (14.8 to 22.0)	6.8 (5.2 to 8.7)	12.5 (8.7 to 17.6)	12.2 (8.8 to 16.5)	10.6 (8.2 to 13.8)
OR (95% CI)	referent	0.32 (0.23 to 0.47) p<0.0001	referent	0.97 (0.56 to 1.7) p=0.90	0.83 (0.50 to 1.4) p=0.47
Bruises	22.7 (19.5 to 26.3)	9.6 (7.4 to 12.4)	16.3 (11.8 to 22.0)	15.6 (12.4 to 19.4)	14.4 (11.3 to 18.3)
OR (95% CI)	referent	0.36 (0.26 to 0.51) p<0.0001	referent	0.95 (0.60 to 1.5) p=0.83	0.87 (0.54 to 1.4) p=0.54

Continued.....

Type of injury**	Gender		Age (years)		
	Boys Rate (95% CI)	Girls Rate (95% CI)	12 Rate (95% CI)	14 Rate (95% CI)	16 Rate (95% CI)
Burns	19.6 (16.0 to 23.8)	21.0 (17.6 to 24.7)	19.1 (14.5 to 24.7)	23.1 (19.1 to 27.6)	18.4 (16.0 to 21.0)
OR (95% CI)	referent	1.1 (0.78 to 1.5) p=0.62	referent	1.2 (0.84 to 1.9) p=0.25	0.95 (0.65 to 1.4) p=0.81
Poisoning	14.6 (11.4 to 18.5)	8.5 (6.3 to 11.2)	11.3 (8.0 to 15.6)	12.3 (9.0 to 16.5)	9.7 (7.1 to 13.0)
OR (95% CI)	referent	0.54 (0.35 to 0.83) p=0.005	referent	1.1 (0.66 to 1.8) p=0.69	0.84 (0.51 to 1.4) p=0.52
Other	9.4 (7.7 to 11.4)	4.4 (3.1 to 6.3)	5.8 (3.7 to 9.0)	8.3 (6.3 to 10.8)	5.5 (4.2 to 7.0)
OR (95% CI)	referent	0.45 (0.29 to 0.68) p<0.0001	referent	1.4 (0.84 to 2.5) p=0.18	0.94 (0.54 to 1.6) p=0.82

* Numbers exclude missing values.
* Type of injury is not mutually exclusive.

CHAPTER 6

RESULTS II

Investigation of factors associated with serious injury

6.1 Introduction

In any population, before implementation of injury prevention policies, the risk factors for the occurrence of injury need to be identified. However, as I have shown in chapter 2, based on a review of research published about injury in Eastern Mediterranean countries, little is known about the determinants of injury among the children in this region. The common risk factors that were investigated by a few studies were: socio-economic status (70, 76, 95, 102), supervision (54, 87), family size (54, 71, 76, 87, 101), use of seat belt or bicycle helmet (58, 59, 105) and access to health care (56, 94). In addition, age and gender, non-modifiable risk factors, were identified in most of the published studies from Eastern Mediterranean countries. The aim of the current chapter is to investigate which of the factors that are listed in figure 4.1, page 118 (causal pathway diagram of potential risk factors) will be associated with the having serious injury in the Palestinian children.

6.2 Results

6.2.1 Univariate analyses

6.2.1.1 Demographic factors: As shown by Table 6.1, more boys (n=1,015, 33.3%) than girls (n=646, 20.1%) reported having a serious injury; the odds ratio for serious injury in boys compared to girls was 2.0 (1.6 to 2.4). Children aged 12 years were more likely to report having a serious injury (n=713, 33.3%) than children aged 14 years (n=541, 23.9%) and children aged 16 years (n=407, 19.2%); the odds ratios for serious injury in children aged 14 and 16 years compared to children aged 12 years were 0.67 (0.52 to 0.85) and 0.49 (0.38 to 0.63) respectively. However, no significant associations were indicated between school type, area, and family size with the occurrence of serious injury.

6.2.1.2 Socio-economic factors: Children who responded that their families were "not at all well off" reported having a serious injury (n=118, 34.0%) more than children who responded to the other categories. Children of "average well off" families were at reduced risk of having serious injury compared to children who responded that their families were "very well off". However, children who reported on "not at all well off" families were at higher risk of having serious injury compared to children who responded that their families were "very well off". The odds ratios for serious injury for children reporting "average well off" were 0.83 (0.71 to 0.97) and 1.3 (0.98 to 1.6) for a response of "not at all well off" (Table 6.2).

The prevalence of serious injury in children who responded to the category "go to bed hungry" (n=655, 31.7%) was higher than children who did not respond positively to this question (n=971, 23.6%); the odds ratio for serious injury was 1.5 (1.3 to 1.8). In addition, the prevalence of serious injury in children who reported low family affluence (n=511, 30.1%) was higher than that in children who reported middle family affluence (n=978, 24.8%), and than that in children who reported high family affluence (n=93, 22.3%). Compared to children who reported high family affluence; the odds ratio for serious injury in children who reported middle family affluence was 1.1 (0.86 to 1.4), and in children who reported low family affluence compared to high family affluence the OR was 1.4 (1.1 to 1.8) (Table 6.2). Compared to children who reported that their mothers studied in, or graduated at university, the odds ratios for serious injury in children who reported that their mothers: did not graduate at high school 0.82 (0.67 to 1.0), graduated at high school 0.90 (0.73 to 1.1) were lower (Table 6.2). In contrast, the odds ratio for serious injury in children who reported that their mothers studied after high school but not at university 1.2 (0.95 to 1.5) was higher (Table 6.2).

6.2.1.3 Social and leisure factors: The prevalence of serious injury in children who reported riding a bike (n=1,099, 32.7%) was higher than that in children who reported not riding a bike (n=526, 18.5%); the odds ratio for serious injury was 2.1 (1.8 to 2.5). The prevalence of serious injury in children who reported spending time out with friends (n=813, 31.3%) was higher than that in children not spending time out with friends (n=815, 22.9%); the odds ratio for serious injury was 1.5 (1.3 to 1.8). There was

no significant association between reporting of physical activity and having serious injury (Table 6.3).

6.2.1.4 Individual health- Physical health factors:

The prevalence of serious injury in children who reported a headache every day (n=900, 24.0%) was lower than in children who reported not having headache every day (n=660, 29.4%); the odds ratio was 0.76 (0.67 to 0.86). However the prevalence of serious injury in children who reported having stomach ache every day (n=1,178, 27.3%) was higher than that in children who reported not having stomach ache every day (n=376, 23.7%); the odds ratio was 1.2 (1.0 to 1.5) (Table 6.4).

The prevalence of serious injury in children who reported having back ache every day (n=1,329, 25.3%) was lower than the prevalence of serious injury in children who reported not having back ache every day (n=193, 34.6%); the odds ratio was 0.64 (0.52 to 0.80) (Table 6.4). The prevalence of serious injury in children who reported feeling dizzy every day (n=917, 30.3%) was higher than in children who reported not feeling dizzy every day (n=614, 21.7%); the odds ratio was 1.6 (1.4 to 1.8) (Table 6.4).

6.2.1.5 Psychological health factors: The prevalence of serious injury in children who reported feeling low most days (n=826, 28.8%) was higher than in children who reported not feeling low most days (n=664, 23.1%); the odds ratio was 1.4 (1.2 to 1.6). Non-significant differences were noted between the prevalence of serious injury in children who reported feeling nervous, bad temper and sleeping difficulties every day and those do not have these symptoms every day (Table 6.4).

6.2.1.6 Chronic health factors: The prevalence of serious injury in children who reported suffering from asthma (n=294, 35.8%) was higher than that in children who reported not suffering from asthma (n=1,241, 24.5%); the odds ratio was 1.7 (1.4 to 2.1). The prevalence of serious injury in children who reported suffering from diabetes (n=67, 36.0%) was higher than that in children who reported not suffering from diabetes (n=1,431, 25.7%); the odds ratio was 1.6 (1.1 to 2.3). In addition, the prevalence of serious injury in children who reported having physical disabilities (n=179, 34.7%) was

higher than that in children who reported not having physical disabilities (n=1,323, 25.1%); the odds ratio was 1.6 (1.3 to 1.9) (Table 6.4).

6.2.1.7 Risk taking behaviours: The prevalence of serious injury in children who reported participating in physical fighting in the two months prior to the survey (n=998, 31.5%) was higher than that in children who did not (n=632, 20.5%); the corresponding odds ratio was 1.8 (1.5 to 2.1). In addition, children who reported that they had been bullied were more likely to report serious injury (n=989, 30.4%) than children who had not been bullied (n=637, 21.6%); the odds ratio was 1.6 (1.4 to 1.8). The prevalence of serious injury in children who reported that they carried a weapon in the 30 days prior to the survey (n=569, 34.0%) was higher than that in children who did not carry a weapon in the 30 days prior to the survey (1,059, 23.5%); the odds ratio was 1.7 (1.4 to 2.0). Children who reported that they smoked had a higher prevalence of serious injury (n=240, 38.4%) than children who did not smoke (n=1,391, 25.0%); the odds ratio was 1.8 (1.6 to 2.2) (Table 6.5).

6.2.2 Multivariate analyses

The independence of the univariate factors associated with serious injury was examined through several multivariate models (Tables 6.6 to 6.10). In these first sets of analyses, variables were adjusted for all other factors in the "blocks" where each "block" included similar types of variables. Finally all variables were considered in one model (Table 6.11). In all multivariable analyses I restricted the analyses to school children who completed data on all variables that had identified in my analysis strategy. This reduced the numbers in the analysis to 4,263 children with completed responses on all variables. I investigated whether those with missing data on the variables of interest were different to those without missing data for a few key socio-economic variables and found that; living in Gaza; reporting going to bed hungry but not gender or age were associated with providing more complete data.

Demographic factors were examined in one model (Table 6.6). Gender and age were significantly associated with the occurrence of serious injury. The adjusted odds ratio for serious injury comparing boys to girls was 1.8 (1.5 to 2.2). The adjusted odds ratios

for serious injury in children aged 14 and 16 years compared to children aged 12 years were 0.68 (0.53 to 0.86) and 0.47 (0.36 to 0.62) respectively.

Socio-economic factors were examined in another model (Table 6.7). The indicators that were significantly associated with the occurrence of serious injury were: how well off is the child's family (adjusted odds ratio for serious injury in children who reported their family as "average well off" compared to those "very well off" was 0.76 (0.64 to 0.91)); going to bed hungry (adjusted odds ratios for children who reported "going to bed hungry" compared to children who did not was 1.5 (1.2 to 1.8)); and family affluence (adjusted odds ratio for children who reported their family as "low affluence" compared to children who reported their family as "high affluence" was 1.4 (1.03 to 2.0)).

Social and leisure factors were examined in one model (Table 6.8). The indicators that were significantly associated with the occurrence of serious injury were: riding a bike (adjusted odds ratio for serious injury in children who reported "riding a bike" compared to those who "do not ride a bike" was 1.8 (1.07 to 1.5)); time out with friends (adjusted odds ratio for serious injury in children who reported "spending time out with friends" compared to children who "were not spending time out with friends" was 1.3 (1.6 to 2.2)).

When health factors were analysed (Table 6.9), serious injury was found to be strongly associated with feeling dizzy, asthma and physical disability. Children who reported feeling dizzy most days were more likely to have serious injury than those who did not with adjusted OR of 1.4 (1.2 to 1.6). Children with asthma were also more likely to report serious injury compared to children who were not asthmatic with adjusted OR of 1.5 (1.2 to 1.9), as were those with a physical disability compared to children who are not physically disabled with adjusted OR of 1.4 (1.1 to 1.8).

All the risk-taking behaviours showed significant associations with the occurrence of serious injury when examined in a single model (Table 6.10). Children who reported being bullied were more likely to report serious injury compared to those who were not

bullied with adjusted OR of 1.3 (1.15 to 1.6). In addition, children who smoked were more likely to report serious injury compared to those who did not smoke (adjusted OR of 1.3 (1.06 to 1.7). Children who reported participating in fighting compared to children who did not were more likely to report significant injury, adjusted odds ratio of 1.3 (1.03 to 1.5). The reporting of carrying a weapon by the children was significantly associated with the occurrence of serious injury compared to children who did not report carrying a weapon with adjusted odds ratio of 1.2 (1.04 to 1.5) (Table 6.10).

A final model was run using all the variables used in the previous separate block models (Table 6.11). Compared to girls, boys were more likely to report serious injury with adjusted OR of 1.2 (0.99 to 1.6), however this association was not significant any more. Children aged 14 and 16 years were less likely to have serious injury compared to children aged 12 years with adjusted ORs of 0.67 (0.52 to 0.86) and 0.50 (0.37 to 0.68) respectively. Compared to children who responded that their family were very well off, children who reported that their family was average well off were less likely to have serious injury, with adjusted OR of 0.83 (0.70 to 0.98) (Table 6.11).

In the final model, children who reported riding a bike were more likely to have serious injury compared to children who did not ride a bike, with adjusted OR of 1.5 (1.2 to 1.8). Children who reported feeling dizzy most days were more likely to have serious injury compared to children who did, with adjusted OR of 1.2 (1.1 to 1.4). Children who reported feeling nervous about every day were more likely to have serious injury compared to children who did not, with adjusted OR of 1.3 (1.02 to 1.6). In the same context, children who reported having bad temper every day were less likely to have serious injury compared to children who did not, with adjusted OR of 0.81 (0.65 to 1.0). In addition, children who reported having asthma or physical disability were more likely to have serious injury compared to children who did not, with similar adjusted OR of 1.3 (1.0 to 1.6) (Table 6.11). Children who reported that they were bullied or had been fighting were more likely to report serious injury with adjusted ORs of 1.2 (1.04 to 1.4), and 1.3 (1.1 to 1.5) respectively (Table 6.11).

6.2.3 Sensitivity analyses

6.2.3.1 Missing serious injury

I investigated the effects of missing data on my results. Table 6.12 shows the proportions with missing data on serious injury tabulated for selected risk factors. Compared to children who were studying in governmental and private schools and children who were living in the West Bank, children who were studying in UNRWA and those living in the Gaza Strip were more likely to provide complete responses. For the rest of the variables similar levels of completeness were found.

6.2.3.2 Missing values on outcome

The number of children with missing data on serious injury was small (n=274, 4.0%) and was higher in girls (n=170, 4.7%) than boys (n=104, 3.2%) p = 0.07 suggesting that missing values were not randomly missing (Table 6.12). Similar results to the final model were observed when assuming that all missing data were negative for serious injury (Table 6.13). Under the assumption that all missing data were positive for serious injury, certain estimates changed. Reflecting the fact that girls had more missing outcome data than boys, the odds ratios for girls compared to boys were attenuated (Table 6.14) from 1.2, p =0.06 in (Table 6.11) to 1.1, p=0.40 in (Table 6.14). Consistent attenuation in the significant levels was observed all through the variables that used in the model and presented in (Table 6.11).

6.2.4 Serious injury by location

In the following sections I will present the results from analyses that investigated factors associated with serious injury in the following locations: home (n=404, 9.9%), school (n=145, 3.6%), street (n=139, 3.5%), sport (n=88, 1.9%) and other locations (n=261, 6.1%) (Table 6.15). As in the multivariable analysis presented above (Table 6.11) the analyses were restricted to those with complete data on all potential variables of interest. There were relatively few reports of serious injury at school, in the street or at sports facility so many of the analyses were lacking power.

6.2.4.1 Serious injury at home

Boys were less likely to be injured in the home than girls (OR=0.78) but the 95% CIs crossed one. For children aged 14 and 16 years, compared to children aged 12 years, the fully adjusted odds ratios for injury occurrence in the home relative to non-injured children were 0.58 (0.41 to 0.80) and 0.49 (0.32 to 0.73) respectively. Children who reported studying at private schools were observed to have higher risk of serious injury at home compared to children who reported studying at governmental schools, with odds ratio of 1.6 (1.13 to 2.25). Children who reported their family as being "average well off" had a lower OR for injury at home compared to children who reported their family as "very well off", with odds ratio of 0.77 (0.60 to 0.98). On the other hand, Children who reported "going to bed hungry" were at increased risk of having serious injury compared to children who do not, with odds ratio of 1.42 (1.11 to 1.83).

For children reported "riding a bike" compared to children who did not, the odds ratio for injury relative to non-injured 1.35 (1.01 to 1.80) (Table 6.15). For the children who reported "being bullied" compared to the children who did not, the odds ratio for injury in the home relative to non-injured was 1.45 (1.14 to 1.83). Furthermore, in children who reported "physical fighting" compared to children who did not, the odds ratio for home injury relative to non-injured was higher 1.3 (1.04 to 1.6) (Table 6.15).

6.2.4.2 Serious injury at school

Of the socio-economic and demographic factors only the question on perception of affluence was significantly associated with serious injury at school and mother does not have a job, with odds ratios of 0.68 (0.48 to 0.98) and 1.70 (1.01 to 2.88) respectively. Of all the other risk taking behaviour variables only "smoking" was associated with an increased odds ratio for serious injury OR=2.0 (1.06 to 3.67).

6.2.4.3 Serious injury in the street

For boys compared to girls, the fully adjusted odds ratio of injury occurrence in the street relative to non-injured was 2.4 (1.4 to 4.1). In addition, for children aged 16 years compared to children aged 12 years, the odds ratio of injury in the street was 0.32 (0.17 to 0.61). Compared to children who reported studying at governmental school, the odds

of serious injury in children who reported studying in UNRWA schools was higher, 1.78 (1.10 to 2.90). Children who reported riding a bike were more likely to have serious injury compared to children who did not report riding a bike, with odds ratio of 1.70 (1.01 to 2.81). Children who reported spending time out with friends were more likely to have serious injury at street compared to children who do not report spending time out with friends, with odds ratio of 1.58 (1.02 to 2.43). Interestingly, the odds ratio of having serious injury, in the street, in children with physical disability was higher than that in children without physical disability 1.76 (1.02 to 3.03). Compared to children who reported they did not participate in fighting, the odds ratio of having serious injury at street in children who participate in fighting was increased, OR= 1.71 (1.11 to 2.65) (Table 6.15).

6.2.4.4 Serious injury at sports' facility

As shown by table 6.15, for boys compared to girls, the fully adjusted odds ratio for injury occurrence relative to non-injured was 7.03 (3.04 to 16.2). Compared to children who reported that their father graduated at university, children who reported that "their father studied after high school but not at university" and "their father did not graduated at high school" were less likely to have serious injury at sport facility, with odds ratios of 0.39 (0.16 to 0.97) and 0.47 (0.24 to 0.88) respectively. The odds of having serious injury in children who reported riding a bike was twice than that in children who reported not riding a bike, 2.06 (1.01 to 4.21). Among children who reported "feeling low about every day" compared to children who did not, the odds ratio for injury relative to non-injured was 1.94 (1.20 to 3.16) (Table 6.15).

6.2.4.5 Serious injury at other locations

Other locations included commercial or business area (n=51, 0.79%), countryside (n=113, 1.75%) and other miscellaneous locations (n=97, 1.6%). In fully adjusted multinomial model, significant factors included age (OR of 0.56 (0.35 to 0.89)) in children aged 16 years compared to children aged 12 years); "Gaza" versus "West Bank" (OR= 1.61, 1.10 to 2.36); "father did not graduate at high school" versus "father graduate at university" (OR=1.63, 1.05 to 2.53); "smoking" versus "not smoking" (OR= 1.78, 1.22 to 2.6) (Table 6.15).

6.3 Summary

Overall, the main factors independently associated with serious injury were demographic factors (being a boy and being at younger age), social and leisure activities (riding a bike), physical health (feeling dizzy), psychological health (bad temper and feeling nervous), chronic disease (having asthma and physical disability), and risk taking behaviours (being bullied and participating in fight). Of the socio-economic factors only the relative family affluence (average) showed a significant association with having serious injury. Investigating serious injury by location revealed that in the street and sport facility boys were more likely to report serious injury compared to girls. Compared to children aged 12 years, children aged 16 years were less likely to report serious injury in any of the reported places.

Table 6.1 Univariate analysis of demographic factors and serious injury in Palestinian children asked about serious injury

Demographic factors	Not serious injury N (%)	Serious injury N (%)	Odds ratio (95% CI)	P-value
Gender (N=6,453)				
Girls	2,678 (79.9)	646 (20.1)	1 (referent)	
Boys	2,114 (66.7)	1,015 (33.3)	2.0 (1.6 to 2.4)	P_h<0.0001
Age (years) (N=6,453)				
12	1,454 (66.7)	713 (33.3)	1 (referent)	
14	1,658 (76.1)	541 (23.9)	0.67 (0.52 to 0.85)	
16	1,680 (80.8)	407 (19.2)	0.49 (0.38 to 0.63)	P_h<0.0001 P_t<0.0001
School Type (N=6,453)				
Government	3,940 (74.6)	1,303 (25.4)	1 (referent)	
Private	130 (71.0)	55 (29.0)	1.3 (0.80 to 2.0)	
UNRWA	722 (71.0)	303 (29.0)	1.3 (0.95 to 1.7)	P_h =0.35
Area (N=6,453)				
West Bank	2,636 (73.6)	897 (26.4)	1 (referent)	
Gaza	2,156 (73.6)	764 (26.4)	1.0 (0.84 to 1.3)	P_h =1.0
Family size (N=6,337)				
Less than five	1,500 (72.4)	559 (27.6)	1 (referent)	
Five and more	3,219 (74.5)	1,059 (25.5)	0.88 (0.76 to 1.0)	P_h =0.20

P_h- test for homogeneity, P_t- test for trend

Table 6.2 Univariate analysis of socio-economic factors and serious injury

Socio-economic factors	Not serious injury N (%)	Serious injury N (%)	Odds ratio (95% CI)	P-valuc
Family well (N=6,354)				
Very well off	1,746 (72.5)	655 (27.5)	1 (referent)	
Average	2,733 (75.4)	854 (24.6)	0.83 (0.71 to 0.97)	
Not at all well	248 (66.0)	118 (34.0)	1.3 (0.98 to 1.6)	P_h=0.002
Father has a job (N=6,271)				
Yes	3,294 (74.7)	1,077 (25.3)	1 (referent)	
No	1,381 (71.9)	519 (28.1)	1.5 (1.0 to 1.3)	P_h =0.04
Mother has a job (N=6,226)				
Yes	804 (71.5)	309 (28.5)	1 (referent)	
No	3,838 (74.4)	1,275 (25.6)	0.86 (0.71 to 1.1)	P_h =0.14
Fathers' education (N=6,228)				
Studied in, or graduated at university	942 (75.8)	295 (24.2)	1 (referent)	
Studied after high school but not at university	531 (68.7)	229 (31.3)	1.4 (1.1 to 1.7)	
Graduated at high school	1,326 (72.9)	479 (27.1)	1.2 (0.96 to 1.4)	
Did not graduate at high school	1,836 (74.9)	590 (25.1)	1.0 (0.86 to 1.2)	P_h =0.008 P_t =0.60
Mothers' education (N=6,231)				
Studied in, or graduated at university	566 (72.3)	218 (27.7)	1 (referent)	
Studied after high school but not at university	361 (68.7)	162 (31.3)	1.2 (0.91 to 1.5)	
Graduated at high school	1,579 (73.2)	547 (26.8)	0.90 (0.73 to 1.1)	
Did not graduated at high school	2,128 (75.5)	670 (24.5)	0.82 (0.67 to 1.0)	P_h =0.01 P_t =0.007

Continued...

Potential risk factor	Not serious injury N (%)	Serious injury N (%)	Odds ratio (95% CI)	P-value
Poverty (going to bed hungry), (N=6,344)				
No	3,278 (76.4)	971 (23.6)	1 (referent)	
Yes	1,440 (68.3)	655 (31.7)	1.5 (1.3 to 1.8)	P_h<0.0001
Family Affluence Scale (FAS)[†] (N=6,221)				
High	322 (77.7)	93 (22.3)	1 (referent)	
Middle	3,069 (75.2)	978 (24.8)	1.1 (0.86 to 1.4)	
Low	1,248 (69.9)	511 (30.1)	1.4 (1.1 to 1.8)	P_h =0.0006 P_t<0.0001
Travel by a car (N=6,390)				
No	242 (78.8)	65 (21.1)	1 (referent)	
Yes	4,509 (73.4)	1,574 (26.6)	1.3 (0.94 to 1.8)	P_h =0.12

P_h- test for heterogeneity, P_t- test for trend

[†] FAS was generated using the following indicators, family own a car, van or truck, have your own bedroom, family vacation and number of computers owned by the family.

Table 6.3 Univariate analysis of social and leisure activities and serious injury

Social and leisure activities	Not serious injury N (%)	Serious injury N (%)	Odds ratio (95% CI)	P-value
Physically active 7 days prior to the survey (N=6,330)				
Not active	749 (76.4)	232 (23.6)	1 (referent)	
1 to 3 days	2,201 (74.4)	725 (25.6)	1.1 (0.81 to 1.4)	
4 to 7 days	1,761 (72.0)	662 (28.0)	1.2 (0.91 to 1.6)	P_h =0.18
Physically active in a typical week (N=6,300)				
Not active	630 (76.6)	197 (23.4)	1 (referent)	
1 to 3 days	2,414 (74.7)	788 (25.3)	1.04 (0.80 to 1.4)	
4 to 7 days	1,653 (71.9)	618 (28.1)	1.2 (0.91 to 1.6)	P_h =0.11
Riding a bike (N=6,360)				
Not riding a bike	2,384 (81.5)	526 (18.5)	1 (referent)	
Riding a bike	2,351 (67.3)	1,099 (32.7)	2.1 (1.8 to 2.5)	P_h<0.0001
Time out with friends (N=6,357)				
No	2,860 (77.1)	815 (22.9)	1 (referent)	
Yes	1,869 (68.7)	813 (31.3)	1.5 (1.3 to 1.8)	P_h<0.0001

P_h- test for heterogeneity

Table 6.4 Univariate analysis of physical, mental health, and chronic diseases factors and serious injury

Physical health factors	Not serious injury N (%)	Serious injury N (%)	Odds ratio (95% CI)	P-value
Number of times having headache (N=6,161)				
Not every day	1,676 (70.6)	660 (29.4)	1 (referent)	
About every day	2,925 (76.0)	900 (24.0)	0.76 (0.67 to 0.86)	P_h<0.0001
Number of times having stomach ache (N=6,074)				
Not every day	1,281 (76.7)	376 (23.7)	1 (referent)	
About every day	3,239 (72.7)	1,178 (27.3)	1.2 (1.0 to 1.5)	P_h=0.01
Number of times having back ache (N=5,953)				
Not every day	401 (65.5)	193 (34.6)	1 (referent)	
About every day	4,030 (74.7)	1,329 (25.3)	0.64 (0.52 to 0.80)	P_h<0.0001
Number of times feeling dizzy (N=6,026)				
Not every day	2,291 (78.3)	614 (21.7)	1 (referent)	
About every day	2,204 (69.7)	917 (30.3)	1.6 (1.4 to 1.8)	P_h<0.0001
Psychological health factors				
Number of times feeling low (N=5,893)				
Not every day	2,268 (76.9)	664 (23.1)	1 (referent)	
About every day	2,135 (71.2)	826 (28.8)	1.4 (1.2 to 1.6)	P_h=0.0002
Irritability or bad temper (N=5,983)				
Not every day	888 (74.3)	298 (25.7)	1 (referent)	
About every day	3,588 (74.1)	1,209 (25.9)	1.0 (0.85 to 1.2)	P_h=0.90
Number of times feeling nervous (N=5,939)				
Not every day	1,090 (76.2)	328 (23.8)	1 (referent)	
About every day	3,345 (73.3)	1,176 (26.7)	1.2 (0.97 to 1.4)	Ph=0.11
Number of times having difficulties in getting to sleep (N=5,951)				
Not every day	1,740 (75.5)	543 (24.5)	1 (referent)	
About every day	2,703 (73.0)	965 (27.0)	1.1 (0.98 to 1.3)	Ph=0.08

Continued...

Chronic diseases factors	Not serious injury N (%)	Serious injury N (%)	Odds ratio (95% CI)	P-value
Suffering from Asthma (N=6,074)				
No	3,989 (75.5)	1,241 (24.5)	1 (referent)	
Yes	550 (64.2)	294 (35.8)	1.7 (1.4 to 2.1)	P_h<0.0001
Suffering from diabetes (N=5,934)				
No	4,316 (74.3)	1,431 (25.7)	1 (referent)	
Yes	120 (64.0)	67 (36.0)	1.6 (1.1 to 2.3)	P_h=0.008
Having physical disabilities such as severe ear or eye impairment (N=5,959)				
No	4,103 (74.9)	1,323 (25.1)	1 (referent)	
Yes	354 (65.3)	179 (34.7)	1.6 (1.3 to 1.9)	P_h<0.0001

P_h- test for heterogeneity, P_t- test for trend

Table 6.5 Univariate analysis of risk taking behaviours and serious injury

Risk taking behaviours	Not serious injury N (%)	Serious injury N (%)	Odds ratio (95% CI)	P-value
Physical fighting in the last two months (N=6,362)				
No	2,466 (79.5)	632 (20.5)	1 (referent)	
Yes	2,266 (68.5)	998 (31.5)	1.8 (1.5 to 2.1)	P_h<0.0001
Being bullied (N=6,360)				
No	2,375 (78.4)	637 (21.6)	1 (referent)	
Yes	2,359 (69.6)	989 (30.4)	1.6 (1.4 to 1.8)	P_h<0.0001
Carrying a weapon during the past 30 days (N=6,377)				
No	3,613 (76.5)	1,059 (23.5)	1 (referent)	
Yes	1,136 (66.0)	569 (34.0)	1.7 (1.4 to 2.0)	P_h<0.0001
Smoking (N=6,362)				
No	4,329 (75.0)	1,391 (25.0)	1 (referent)	
Yes	402 (61.6)	240 (38.4)	1.8 (1.6 to 2.2)	P_h<0.0001

P_h- test for heterogeneity

Table 6.6 Crude and adjusted odds ratios for the association between demographic factors and serious injury

Demographic factors (N=4,263)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Gender				
Girls	1	1		
Boys	2.0	1.8	P<0.0001	1.5 to 2.2
Age (years)				
12	1	1		
14	0.67	0.68	P=0.002	0.53 to 0.86
16	0.49	0.47	P<0.0001	0.36 to 0.62
School type				
Government	1	1		
Private	1.3	1.3	0.17	0.89 to 2.0
UNRWA	1.3	1.03	0.83	0.74 to 1.5
Area				
West Bank	1	1		
Gaza Strip	1.0	1.1	0.51	0.85 to 1.4
Family size				
Less than five	1	1		
Five and more	0.88	0.97	0.67	0.83 to 1.1

* People with complete responses on all variables in the analysis plan
**adjusted for all factors listed in the table

Table 6.7 Crude and adjusted odds ratios for the association between socio-economic factors and serious injury

Socio-economic factors (N=4,263)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Family well off				
Very well off	1	1		
Average	0.83	0.76	P=0.003	0.64 to 0.91
Not very well off	1.3	1.2	P=0.38	0.82 to 1.7
Poverty (going to bed hungry)				
No	1	1		
Yes	1.5	1.5	P<0.0001	1.2 to 1.8
Family affluence				
High	1	1		
Middle	1.1	1.1	P=0.55	0.81 to 1.5
Low	1.4	1.4	0.03	1.03 to 2.0
Travel by a car				
No	1	1		
Yes	1.3	1.3	0.22	0.86 to 2.0
Fathers' education				
Studied in, or graduated at university	1	1		
Studied after high school but not at university	1.4	1.1	0.39	0.86 to 1.5
Graduated at high school	1.2	1.1	0.42	0.88 to 1.4
Did not graduated at high school	1.0	1.0	0.71	0.82 to 1.3
Mothers' education				
Studied in, or graduated at university	1	1		
Studied after high school but not at university	1.2	1.1	0.71	0.78 to 1.5
Graduated at high school	0.90	0.93	0.60	0.71 to 1.2
Did not graduated at high school	0.82	0.83	0.20	0.63 to 1.1

Continued ...

Socio-economic factors (N=4,263)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Father has a job				
Yes	1	1		
No	1.5	1.2	P=0.08	1.0 to 1.4
Mother has a job				
Yes	1	1		
No	0.86	1.02	P=0.84	0.83 to 1.3

* People with complete responses on all variables in the analysis plan
**adjusted for all factors listed in the table

Table 6.8 Crude and adjusted odds ratios for the association between social and leisure activities and serious injury

Social and leisure activities (N=4,263)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Physically active 7 days prior to the survey				
Not active	1	1		
1 to 3 days	1.1	1.1	0.57	0.76 to 1.6
4 to 7 days	1.2	1.1	0.54	0.76 to 1.7
Physical activity in a typical week				
Not active	1	1		
1 to 3 days	1.04	0.83	0.40	0.56 to 1.3
4 to 7 days	1.2	0.93	0.75	0.62 to 1.4
Riding a bike				
Not riding a bike	1	1		
Riding a bike	2.1	1.8	P<0.0001	1.07 to 1.5
Time out with friends				
No	1	1		
Yes	1.5	1.3	P=0.006	1.6 to 2.2

* People with complete responses on all variables in the analysis plan
**adjusted for all factors listed in the table

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Table 6.9 Crude and adjusted odds ratios for the association between health factors and serious injury

Health factors (N=4,263)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Physical health factors				
Headache				
Not every day	1	1		
About every day	0.76	0.98	0.78	0.84 to 1.1
Feeling dizzy				
Not every day	1	1		
About every day	1.6	1.4	P<0.0001	1.2 to 1.6
Back ache				
Not every day	1	1		
About every day	0.64	0.90	0.41	0.68 to 1.2
Stomach ache				
Not every day	1	1		
About every day	1.2	1.1	0.40	0.90 to 1.3
Mental health factors				
Feeling low				
Not every day	1	1		
About every day	1.4	1.1	0.33	0.91 to 1.3
Bad temper				
Not every day	1	1		
About every day	1.0	0.83	0.07	0.68 to 1.01
Feeling nervous				
Not every day	1	1		
About every day	1.2	1.2	0.06	0.99 to 1.5
Sleeping difficulties				
Not every day	1	1		
About every day	1.1	0.97	0.70	0.82 to 1.1
Chronic disease				
Asthma				
No	1	1		
Yes	1.7	1.5	P<0.0001	1.2 to 1.9

Continued ...

Health factors (N=4,263)*	Unadjusted odds ratio	Adjusted odds ratio	P-value	95% CI
Physical disability				
No	1	1		
Yes	1.6	1.4	P=0.003	1.1 to 1.8
Suffering from diabetes				
No	1	1		
Yes	1.6	1.02	0.92	0.62 to 1.7

* Logistic model was run at the complete responses.

Table 6.10 Crude and adjusted odds ratios for the association between risk taking behaviours and serious injury

Risk taking behaviours (N=4,263)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Being bullied				
No	1	1		
Yes	1.6	1.3	P<0.0001	1.15 to 1.6
Smoking				
No	1	1		
Yes	1.8	1.3	0.02	1.06 to 1.7
Fighting				
No	1	1		
Yes	1.6	1.3	P<0.0001	1.03 to 1.5
Carry a weapon				
No	1	1		
Yes	1.7	1.2	0.02	1.04 to 1.5

* People with complete responses on all variables in the analysis plan

**adjusted for all factors listed in the table

Table 6.11 Crude and adjusted odds ratios for the association between potential risk factors and serious injury

Potential risk factors (N=4,263)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Demographic factors				
Gender				
Girls	1	1		
boys	2.0	1.2	0.06	0.99 to 1.6
Age (years)				
12	1	1		
14	0.67	0.67	0.002	0.52 to 0.86
16	0.49	0.50	<0.0001	0.37 to 0.68
School type				
Government	1	1		
Private	1.3	1.4	0.14	0.90 to 2.1
UNRWA	1.3	0.98	0.90	0.71 to 1.4
Area				
West Bank	1	1		
Gaza Strip	1.0	1.1	0.32	0.88 to 1.4
Family size				
Less than five	1	1		
Five and more	0.88	0.96	0.62	0.82 to 1.1
Socio-economic factors				
Family well off				
Very well off	1	1		
Average	0.83	0.83	0.03	0.70 to 0.98
Not very well off	1.3	1.2	0.22	0.87 to 1.8
Poverty (going to bed hungry)				
No	1	1		
Yes	1.5	1.2	0.13	0.96 to 1.4
Family affluence				
High	1	1		
Middle	1.1	1.1	0.60	0.80 to 1.5
Low	1.4	1.2	0.28	0.86 to 1.7

Continued...

Potential risk factors (N=4,263)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Travel by a car				
No	1	1		
Yes	1.3	1.2	0.51	0.76 to 1.8
Fathers' education				
Studied in, or graduated at university	1	1		
Studied after high school but not at university	1.4	1.2	0.22	0.91 to 1.5
Graduated at high school	1.2	1.1	0.27	0.91 to 1.4
Did not graduated at high school	1.0	1.2	0.26	0.90 to 1.5
Mothers' education				
Studied in, or graduated at university	1	1		
Studied after high school but not at university	1.2	1.1	0.51	0.81 to 1.6
Graduated at high school	0.90	0.96	0.79	0.73 to 1.3
Did not graduated at high school	0.82	0.93	0.63	0.68 to 1.3
Father has a job				
Yes	1	1		
No	1.5	1.2	0.13	0.96 to 1.4
Mother has a job				
Yes	1	1		
No	0.86	1.1	0.60	0.85 to 1.3
Social and leisure activities				
Physical activity 7 days prior to the survey				
Not active	1	1		
1 to 3 days	1.1	1.1	0.74	0.74 to 1.5
4 to 7 days	1.2	1.03	0.86	0.71 to 1.5
Physical activity in typical week				
Not active	1	1		
1 to 3 days	1.04	0.91	0.64	0.61 to 1.4
4 to 7 days	1.2	0.94	0.79	0.62 to 1.4

Potential risk factors (N=4,263)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Riding a bike				
Not riding a bike	1	1		
Riding a bike	2.1	1.5	0.001	1.2 to 1.8
Time out with friends				
No	1	1		
Yes	1.5	1.1	0.10	0.97 to 1.4
Individual health				
Physical health				
Headache				
Not every day	1	1		
About every day	0.76	0.91	0.27	0.77 to 1.1
Feeling Dizzy				
Not every day	1	1		
About every day	1.6	1.2	0.01	1.1 to 1.4
Back ache				
Not every day	1	1		
About every day	0.64	0.99	0.98	0.75 to 1.3
Stomach ache				
Not every day	1	1		
About every day	1.2	1.1	0.48	0.89 to 1.3
Mental health				
Feeling low				
Not every day	1	1		
About every day	1.4	1.2	0.10	0.97 to 1.4
Bad temper				
Not every day	1	1		
About every day	1.0	0.81	0.05	0.65 to 1.0
Feeling nervous				
Not every day	1	1		
About every day	1.2	1.3	0.03	1.02 to 1.6

Continued...

Potential risk factors (N=4,263)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Sleeping difficulties				
Not every day	1	1		
About every day	1.1	0.94	0.53	0.80 to 1.1
Chronic disease				
Asthma				
No	1	1		
Yes	1.7	1.3	0.05	1.0 to 1.6
Physical disability				
No	1	1		
Yes	1.6	1.3	0.05	1.0 to 1.6
Suffering from diabetes				
No	1	1		
Yes	1.6	0.85	0.56	0.51 to 1.4
Risk taking behaviours				
Being bullied				
No	1	1		
Yes	1.6	1.2	0.01	1.04 to 1.4
Smoking				
No	1	1		
Yes	1.8	1.2	0.08	0.97 to 1.6
Fighting				
No	1	1		
Yes	1.6	1.3	0.004	1.1 to 1.5
Carrying a weapon				
No	1	1		
Yes	1.7	1.1	0.37	0.90 to 1.3

* People with complete responses on all variables in the analysis plan
**adjusted for all factors listed in the table

Table 6.12 Complete and missing responses in outcome (serious injury) by selected variables

Variables	(%)Missing responses	(%)Complete	P- value*
Gender (N= 6,727)			
Girls	4.7	95.3	0.07
Boys	3.2	96.8	
Age (years) (N= 6,727)			
12	2.8	97.2	
14	4.0	96.0	
16	5.7	94.3	0.08
School type (N= 6,727)			
Government	4.3	95.7	
Private	8.4	91.6	
UNRWA	2.5	97.5	0.005
Area (N= 6,727)			
West Bank	5.1	94.9	
Gaza Strip	2.6	97.4	0.001
Family well off (N= 6,607)			
Very well off	3.8	96.2	
Average	3.8	96.2	
Not very well off	3.2	96.8	0.86
Number of times feeling low (N= 6,123)			
Not every day	3.8	96.2	
About every day	3.7	96.3	0.86
Number of times having difficulties in getting to sleep (N= 6,183)			
Not every day	4.0	96.0	
About every day	3.5	96.5	0.34
Having physical disabilities such as severe ear or eye impairment (N= 6,186)			
No	3.6	96.4	
Yes	3.9	96.1	0.73

Continued.....

Variables	(%)Missing responses	(%)Complete responses	P- value
Number of times smoke tobacco at present (N= 6,611)			
No	3.8	96.2	
Yes	3.0	97.0	0.73
Carrying a weapon during the past 30 days (N= 6,624)			
No	4.0	96.0	
Yes	2.8	97.2	0.09

* P-value from test for association between the selected variables and the missing in the outcome

Table 6.13 Crude and adjusted odds ratios for the association between potential risk factors and serious injury, assuming missing was not injured

Potential risk factors (N=4,449)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Demographic factors				
Gender				
Girls	1	1		
boys	2.0	1.2	0.03	1.03 to 1.6
Age (years)				
12	1	1		
14	0.67	0.66	0.002	0.51 to 0.86
16	0.49	0.50	<0.0001	0.37 to 0.68
School type				
Government	1	1		
Private	1.3	1.3	0.19	0.86 to 2.1
UNRWA	1.3	0.97	0.86	0.70 to 1.3
Area				
West Bank	1	1		
Gaza Strip	1.0	1.2	0.25	0.91 to 1.5
Family size				
Less than five	1	1		
Five and more	0.88	0.99	0.88	0.85 to 1.2
Socio-economic factors				
Family well off				
Very well off	1	1		
Average	0.83	0.82	0.02	0.70 to 0.97
Not very well off	1.3	1.2	0.34	0.84 to 1.7
Poverty (going to bed hungry)				
No	1	1		
Yes	1.5	1.2	0.11	0.97 to 1.4
Family affluence				
High	1	1		
Middle	1.1	1.1	0.61	0.80 to 1.5
Low	1.4	1.2	0.32	0.85 to 1.6

Continued...

Potential risk factors (N=4,449)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Travel by a car				
No	1	1		
Yes	1.3	1.2	0.46	0.77 to 1.8
Fathers' education				
Studied in, or graduated at university	1	1		
Studied after high school but not at university	1.4	1.1	0.31	0.88 to 1.5
Graduated at high school	1.2	1.1	0.23	0.92 to 1.4
Did not graduated at high school	1.0	1.2	0.23	0.91 to 1.5
Mothers' education				
Studied in, or graduated at university	1	1		
Studied after high school but not at university	1.2	1.2	0.37	0.83 to 1.6
Graduated at high school	0.90	0.96	0.79	0.73 to 1.3
Did not graduated at high school	0.82	0.92	0.60	0.68 to 1.2
Father has a job				
Yes	1	1		
No	1.5	1.2	0.10	0.97 to 1.4
Mother has a job				
Yes	1	1		
No	0.86	1.1	0.60	0.86 to 1.3
Social and leisure activities				
Physical activity 7 days prior to the survey				
Not active	1	1		
1 to 3 days	1.1	1.1	0.71	0.75 to 1.5
4 to 7 days	1.2	1.04	0.83	0.71 to 1.5
Physical activity in typical week				
Not active	1	1		
1 to 3 days	1.04	0.91	0.64	0.61 to 1.4
4 to 7 days	1.2	0.94	0.75	0.62 to 1.4

Potential risk factors (N=4,449)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Riding a bike				
Not riding a bike	1	1		
Riding a bike	2.1	1.5	0.001	1.2 to 1.8
Time out with friends				
No	1	1		
Yes	1.5	1.1	0.15	0.96 to 1.3
Individual health				
Physical health				
Headache				
Not every day	1	1		
About every day	0.76	0.90	0.22	0.77 to 1.1
Feeling Dizzy				
Not every day	1	1		
About every day	1.6	1.2	0.006	1.1 to 1.5
Back ache				
Not every day	1	1		
About every day	0.64	0.98	0.90	0.74 to 1.3
Stomach ache				
Not every day	1	1		
About every day	1.2	1.04	0.62	0.88 to 1.2
Mental health				
Feeling low				
Not every day	1	1		
About every day	1.4	1.2	0.10	0.97 to 1.4
Bad temper				
Not every day	1	1		
About every day	1.0	0.81	0.05	0.66 to 0.99
Feeling nervous				
Not every day	1	1		
About every day	1.2	1.3	0.03	1.02 to 1.6

Continued...

Potential risk factors (N=4,449)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Sleeping difficulties				
Not every day	1	1		
About every day	1.1	0.95	0.53	0.80 to 1.1
Chronic disease				
Asthma				
No	1	1		
Yes	1.7	1.3	0.04	1.0 to 1.6
Physical disability				
No	1	1		
Yes	1.6	1.3	0.03	1.0 to 1.7
Suffering from diabetes				
No	1	1		
Yes	1.6	0.84	0.50	0.50 to 1.4
Risk taking behaviours				
Being bullied				
No	1	1		
Yes	1.6	1.2	0.01	1.04 to 1.4
Smoking				
No	1	1		
Yes	1.8	1.3	0.07	0.98 to 1.6
Fighting				
No	1	1		
Yes	1.6	1.3	0.007	1.1 to 1.5
Carrying a weapon				
No	1	1		
Yes	1.7	1.1	0.31	0.91 to 1.3

* People with complete responses on all risk variables in the analysis plan
**adjusted for all factors listed in the table

Table 6.14 Crude and adjusted odds ratios for the association between potential risk factors and serious injury, assuming missing was injured

Potential risk factors (N=4,449)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Demographic factors				
Gender				
Girls	1	1		
boys	2.0	1.1	0.40	0.87 to 1.4
Age (years)				
12	1	1		
14	0.67	0.72	0.02	0.55 to 0.94
16	0.49	0.63	=0.003	0.46 to 0.85
School type				
Government	1	1		
Private	1.3	1.3	0.13	0.91 to 1.9
UNRWA	1.3	0.99	0.99	0.73 to 1.4
Area				
West Bank	1	1		
Gaza Strip	1.0	1.01	0.88	0.81 to 1.3
Family size				
Less than five	1	1		
Five and more	0.88	0.91	0.20	0.78 to 1.05
Socio-economic factors				
Family well off				
Very well off	1	1		
Average	0.83	0.86	0.07	0.73 to 1.01
Not very well off	1.3	1.3	0.16	0.91 to 1.8
Poverty (going to bed hungry)				
No	1	1		
Yes	1.5	1.1	0.37	0.91 to 1.3
Family affluence				
High	1	1		
Middle	1.1	0.96	0.83	0.73 to 1.3
Low	1.4	1.1	0.57	0.80 to 1.5

Continued...

Potential risk factors (N=4,449)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Travel by a car				
No	1	1		
Yes	1.3	1.1	0.58	0.76 to 1.6
Fathers' education				
Studied in, or graduated at university	1	1		
Studied after high school but not at university	1.4	1.2	0.18	0.93 to 1.5
Graduated at high school	1.2	1.1	0.55	0.87 to 1.3
Did not graduated at high school	1.0	1.1	0.49	0.86 to 1.4
Mothers' education				
Studied in, or graduated at university	1	1		
Studied after high school but not at university	1.2	1.1	0.53	0.81 to 1.5
Graduated at high school	0.90	0.94	0.65	0.72 to 1.2
Did not graduated at high school	0.82	0.95	0.74	0.72 to 1.3
Father has a job				
Yes	1	1		
No	1.5	1.1	0.23	0.93 to 1.3
Mother has a job				
Yes	1	1		
No	0.86	1.01	0.86	0.84 to 1.2
Social and leisure activities				
Physical activity 7 days prior to the survey				
Not active	1	1		
1 to 3 days	1.1	0.95	0.75	0.69 to 1.3
4 to 7 days	1.2	0.94	0.71	0.66 to 1.3
Physical activity in typical week				
Not active	1	1		
1 to 3 days	1.04	0.97	0.85	0.68 to 1.4
4 to 7 days	1.2	1.0	0.99	0.69 to 1.4

Potential risk factors (N=4,449)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Riding a bike				
Not riding a bike	1	1		
Riding a bike	2.1	1.4	0.002	1.1 to 1.6
Time out with friends				
No	1	1		
Yes	1.5	1.1	0.11	0.97 to 1.3
Individual health				
Physical health				
Headache				
Not every day	1	1		
About every day	0.76	0.90	0.19	0.77 to 1.1
Feeling Dizzy				
Not every day	1	1		
About every day	1.6	1.1	0.11	0.98 to 1.3
Back ache				
Not every day	1	1		
About every day	0.64	0.94	0.67	0.72 to 1.2
Stomach ache				
Not every day	1	1		
About every day	1.2	1.0	0.98	0.85 to 1.2
Mental health				
Feeling low				
Not every day	1	1		
About every day	1.4	1.1	0.13	0.96 to 1.4
Bad temper				
Not every day	1	1		
About every day	1.0	0.83	0.07	0.68 to 1.02
Feeling nervous				
Not every day	1	1		
About every day	1.2	1.3	0.02	1.04 to 1.5

Continued...

Potential risk factors (N=4,449)*	Unadjusted odds ratio	Adjusted odds ratio**	P-value	95% CI
Sleeping difficulties				
Not every day	1	1		
About every day	1.1	0.98	0.83	0.83 to 1.2
Chronic disease				
Asthma				
No	1	1		
Yes	1.7	1.2	0.09	0.97 to 1.5
Physical disability				
No	1	1		
Yes	1.6	1.2	0.12	0.95 to 1.5
Suffering from diabetes				
No	1	1		
Yes	1.6	0.96	0.87	0.58 to 1.6
Risk taking behaviours				
Being bullied				
No	1	1		
Yes	1.6	1.2	0.03	1.02 to 1.4
Smoking				
No	1	1		
Yes	1.8	1.2	0.21	0.92 to 1.5
Fighting				
No	1	1		
Yes	1.6	1.3	0.001	1.1 to 1.5
Carrying a weapon				
No	1	1		
Yes	1.7	1.1	0.58	0.88 to 1.3

* People with complete responses on all risk variables in the analysis plan
**adjusted for all factors listed in the table

Table 6.15 Factors associated with serious injury by different locations*

Potential risk factors	*Home (n=404) vs no injury (3,226)*			*School (n=145) vs no injury (3,226)*			*Street (n=139) vs no injury (3,226)*			*Sport (n=88) vs no injury (3,226)*			*Others" (n=261) vs no injury (3,226)*		
	OR	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*
Demographic factors															
Gender															
Girls	1			1			1			1			1		
Boys	0.78	0.11	0.57 to 1.06	1.3	0.46	0.65 to 2.54	2.4	P=0.001	1.4 to 4.10	7.03	P<0.0001	3.04 to 16.2	1.30	0.16	0.90 to 1.90
Age (years)															
12	1			1			1			1			1		
14	0.58	P=0.001	0.41 to 0.80	0.63	0.16	0.33 to 1.20	0.67	0.10	0.41 to 1.08	0.89	0.73	0.46 to 1.72	0.81	0.29	0.54 to 1.20
16	0.49	P=0.001	0.32 to 0.73	0.53	0.09	0.26 to 1.10	0.32	P<0.0001	0.17 to 0.61	0.77	0.47	0.38 to 1.56	0.56	0.01	0.35 to 0.89
School type															
Government	1			1			1			1			1		
Private	1.6	0.007	1.13 to 2.25	1.46	0.40	0.60 to 3.54	1.43	0.53	0.47 to 4.38	0.37	0.32	0.05 to 2.68	1.24	0.65	0.48 to 3.20
UNRWA	0.97	0.93	0.59 to 1.61	1.21	0.67	0.50 to 2.95	1.78	0.02	1.10 to 2.90	0.74	0.48	0.32 to 1.69	0.65	0.09	0.40 to 1.06
Area															
West Bank	1			1			1			1			1		
Gaza Strip	0.98	0.93	0.67 to 1.43	0.80	0.50	0.42 to 1.51	1.04	0.86	0.67 to 1.61	1.37	0.21	0.83 to 2.27	1.61	0.01	1.10 to 2.36
Family size															
Less than five	1			1			1			1			1		
Five and more	0.87	0.24	0.69 to 1.10	1.05	0.79	0.72 to 1.52	1.28	0.21	0.87 to 1.88	0.77	0.28	0.50 to 1.22	0.97	0.81	0.73 to 1.28
Socio-economic factors															
Family well off															
Very well off	1			1			1			1			1		
Average	0.77	0.04	0.60 to 0.98	0.68	0.04	0.48 to 0.98	1.33	0.15	0.91 to 1.96	0.88	0.65	0.51 to 1.52	0.81	0.17	0.60 to 1.10
Not very well off	1.21	0.43	0.74 to 2.01	1.24	0.59	0.56 to 2.77	1.65	0.19	0.77 to 3.52	2.10	0.16	0.75 to 5.87	0.79	0.51	0.40 to 1.58
Poverty															
No	1			1			1			1			1		
Yes	1.42	0.005	1.11 to 1.83	1.01	0.97	0.56 to 1.82	0.85	0.38	0.58 to 1.22	1.44	0.15	0.87 to 2.38	0.97	0.90	0.69 to 1.38

Continued.....

Potential risk factors	*Home (n=404) vs no injury (3,226)*			*School (n=145) vs no injury (3,226)*			*Street (n=139) vs no injury (3,226)*			*Sport (n=88) vs no injury (3,226)*			*Others" (n=261) vs no injury (3,226)*		
	OR	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*
Family affluence scale															
High	1			1			1			1			1		
Middle	0.93	0.76	0.60 to 1.44	1.04	0.90	0.52 to 2.11	0.84	0.63	0.41 to 1.71	2.44	0.15	0.72 to 8.34	1.35	0.33	0.74 to 2.46
Low	0.90	0.67	0.57 to 1.44	0.88	0.71	0.43 to 1.77	1.17	0.67	0.56 to 2.43	2.31	0.22	0.61 to 8.80	1.94	0.03	1.06 to 3.54
Travel by a car															
No	1			1			1			1			1		
Yes	1.64	0.17	0.81 to 3.34	1.30	0.59	0.50 to 3.34	0.98	0.96	0.44 to 2.18	1.18	0.80	0.32 to 4.45	0.72	0.24	0.41 to 1.25
Fathers' education															
Graduated at university	1			1			1			1			1		
Studied after high school but not at university	1.06	0.77	0.73 to 1.52	1.27	0.46	0.67 to 2.41	1.93	0.06	0.99 to 3.78	0.39	0.04	0.16 to 0.97	1.41	0.17	0.86 to 2.31
Graduated at high school	1.11	0.50	0.81 to 1.52	1.04	0.87	0.61 to 1.80	1.38	0.25	0.80 to 2.40	0.63	0.10	0.36 to 1.10	1.37	0.16	0.88 to 2.11
Did not graduated at high school	1.20	0.29	0.86 to 1.68	1.20	0.52	0.68 to 2.10	0.85	0.62	0.47 to 1.57	0.47	0.02	0.24 to 0.88	1.63	0.03	1.05 to 2.53
Mothers' education															
Graduated at university	1			1			1			1			1		
Studied after high school but not at university	1.4	0.19	0.86 to 2.15	0.57	0.21	0.23 to 1.37	1.34	0.49	0.57 to 3.17	0.67	0.53	0.20 to 2.30	1.02	0.95	0.55 to 1.89
Graduated at high school	0.97	0.88	0.66 to 1.42	0.95	0.86	0.54 to 1.64	1.07	0.86	0.51 to 2.21	1.11	0.78	0.53 to 2.32	0.85	0.50	0.52 to 1.37
Did not graduated at high school	0.90	0.64	0.59 to 1.38	0.81	0.48	0.45 to 1.44	1.50	0.26	0.74 to 3.0	1.42	0.33	0.70 to 2.90	0.70	0.18	0.42 to 1.18
Father has a job															
Yes	1			1			1			1			1		
No	1.17	0.23	0.90 to 1.50	1.16	0.50	0.76 to 1.78	1.03	0.86	0.69 to 1.55	1.15	0.55	0.72 to 1.84	1.18	0.27	0.87 to 1.61
Mother has a job															
Yes	1			1			1			1			1		
No	0.98	0.88	0.72 to 1.32	1.70	0.05	1.01 to 2.88	0.84	0.47	0.52 to 1.34	1.10	0.76	0.60 to 2.00	1.05	0.81	0.70 to 1.57

Continued.....

Potential risk factors	*Home (n=404) vs no injury (3,226)*			*School (n=145) vs no injury (3,226)*			*Street (n=139) vs no injury (3,226)*			*Sport (n=88) vs no injury (3,226)*			*Others" (n=261) vs no injury (3,226)*		
	OR	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*
Social and leisure activities															
Physical activity 7 days prior to the survey															
Not active	1			1			1			1			1		
1 to 3 days	1.10	0.72	0.67 to 1.77	0.68	0.47	0.23 to 1.95	1.16	0.70	0.54 to 2.52	1.32	0.67	0.36 to 4.84	1.20	0.45	0.75 to 1.90
4 to 7 days	1.14	0.61	0.68 to 1.91	0.70	0.53	0.23 to 2.11	0.81	0.63	0.35 to 1.90	1.16	0.83	0.28 to 4.90	1.26	0.40	0.74 to 2.15
Physical activity in typical week															
Not active	1			1			1			1			1		
1 to 3 days	0.82	0.51	0.47 to 1.46	1.64	0.35	0.58 to 4.70	0.82	0.62	0.38 to 1.79	0.97	0.96	0.29 to 3.28	0.81	0.37	0.51 to 1.30
4 to 7 days	0.85	0.59	0.47 to 1.53	1.53	0.40	0.57 to 4.10	0.73	0.52	0.28 to 1.88	1.21	0.78	0.32 to 4.54	0.92	0.73	0.55 to 1.52
Riding a bike															
Not riding a bike	1			1			1			1			1		
Riding a bike	1.35	0.04	1.01 to 1.80	1.76	0.10	0.90 to 3.48	1.70	0.04	1.01 to 2.81	2.06	0.05	1.01 to 4.21	1.27	0.16	0.91 to 1.80
Time out with friends															
No	1			1			1			1			1		
Yes	1.18	0.20	0.92 to 1.50	0.96	0.84	0.65 to 1.41	1.58	0.04	1.02 to 2.43	1.55	0.09	0.94 to2.58	0.94	0.69	0.69 to 1.28
Individual health															
Physical health															
Headache															
Not every day	1			1			1			1			1		
About every day	0.89	0.31	0.71 to 1.11	0.81	0.30	0.53 to 1.21	1.10	0.65	0.73 to 1.68	0.89	0.63	0.57 to 1.40	0.95	0.71	0.71 to 1.25
Feeling dizzy															
Not every day	1			1			1			1			1		
About every day	1.15	0.28	0.89 to 1.48	1.14	0.57	0.72 to 1.83	1.28	0.20	0.87 to 1.87	1.41	0.15	0.88 to 2.26	1.34	0.07	0.98 to 1.84
Back ache															
Not every day	1			1			1			1			1		
About every day	0.84	0.36	0.57 to 1.22	1.40	0.31	0.74 to 2.65	0.92	0.79	0.51 to 1.66	1.58	0.31	0.65 to 3.82	0.99	0.98	0.59 to 1.67

Continued.....

Potential risk factors	*Home (n=404) vs no injury (3,226)*			*School (n=145) vs no injury (3,226)*			*Street (n=139) vs no injury (3,226)*			*Sport (n=88) vs no injury (3,226)*			*Others* (n=261) vs no injury (3,226)*		
	OR	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*
Stomach ache															
Not every day	1			1			1			1			1		
About every day	1.13	0.36	0.86 to 1.49	0.93	0.74	0.58 to 1.47	1.08	0.70	0.72 to 1.61	1.11	0.72	0.61 to 2.03	1.02	0.88	0.75 to 1.40
Psychological health															
Feeling low															
Not every day	1			1			1			1			1		
About every day	1.06	0.62	0.83 to 1.35	1.13	0.54	0.76 to 1.70	1.31	0.23	0.84 to 2.04	1.94	0.007	1.20 to 3.16	1.10	0.58	0.80 to 1.48
Bad temper															
Not every day	1			1			1			1			1		
About every day	0.91	0.54	0.66 to 1.24	0.87	0.61	0.51 to 1.49	0.65	0.10	0.39 to 1.09	0.87	0.73	0.39 to 1.92	0.72	0.11	0.48 to 1.08
Feeling nervous															
Not every day	1			1			1			1			1		
About every day	1.32	0.10	0.95 to 1.82	1.20	0.48	0.72 to 1.97	0.95	0.83	0.59 to 1.53	1.27	0.52	0.61 to 2.68	1.41	0.10	0.93 to 2.13
Sleeping difficulties															
Not every day	1			1			1			1			1		
About every day	0.92	0.54	0.71 to 1.20	0.94	0.78	0.62 to 1.42	1.20	0.31	0.84 to 1.73	1.09	0.76	0.64 to 1.84	0.85	0.27	0.63 to 1.13
Chronic disease															
Asthma															
No	1			1			1			1			1		
Yes	1.19	0.35	0.83 to 1.70	1.16	0.61	0.65 to 2.04	1.54	0.12	0.89 to 2.67	1.33	0.40	0.68 to 2.60	1.34	0.12	0.92 to 1.94
Physical disability															
No	1			1			1			1			1		
Yes	1.46	0.06	0.99 to 2.13	1.34	0.40	0.68 to 2.64	1.76	0.04	1.02 to 3.03	0.86	0.70	0.42 to 1.80	0.88	0.60	0.55 to 1.41
Suffering from diabetes															
No	1			1			1			1			1		
Yes	0.81	0.62	0.34 to 1.89	0.93	0.91	0.26 to 3.30	0.34	0.18	0.07 to 1.68	0.24	0.11	0.04 to 1.37	1.65	0.20	0.76 to 3.60

Continued.....

Potential risk factors	*Home (n=404) vs no injury (3,226)*			*School (n=145) vs no injury (3,226)*			*Street (n=139) vs no injury (3,226)*			*Sport (n=88) vs no injury (3,226)*			*Others** (n=261) vs no injury (3,226)*		
	OR	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*	*OR*	*P-value*	*95% CI*
Risk taking behaviours															
Being bullied															
No	1			1			1			1			1		
Yes	1.45	0.002	1.14 to 1.83	1.36	0.11	0.94 to 2.0	1.20	0.35	0.82 to 1.77	1.18	0.52	0.71 to 2.0	0.91	0.49	0.68 to 1.20
Smoking															
No	1			1			1			1			1		
Yes	0.68	0.09	0.44 to 1.06	2.00	0.03	1.06 to 3.67	1.58	0.06	0.97 to 2.57	0.76	0.41	0.38 to 1.48	1.78	0.003	1.22 to 2.60
Physical fighting															
No	1			1			1			1			1		
Yes	1.3	0.02	1.04 to 1.60	0.90	0.62	0.58 to 1.38	1.71	0.01	1.11 to 2.65	1.14	0.61	0.68 to 1.92	1.38	0.06	0.98 to 1.93
Carrying a weapon															
No	1			1			1			1			1		
Yes	0.98	0.93	0.74 to 1.31	1.25	0.32	0.81 to 1.93	0.92	0.71	0.59 to 1.43	1.52	0.09	0.94 to 2.48	1.1	0.60	0.79 to 1.49

* Multinomial analysis including only people with complete data on variables in the model

** Others represent commercial or business area, countryside and other locations that were not specified by the children

CHAPTER 7

Methodological issues

The discussion consists of two parts. In part I (Chapter 7) I will discuss methodological concerns in the interpretation of the findings of the three chapters in the thesis: (i) literature review of the occurrence of injury in the Eastern Mediterranean countries and Israel, (ii) the use of routine data to investigate injury mortality in the Palestinian Territory, compared to Israel, England and Wales, (iii) the HBSC survey's data to assess the occurrence of non-fatal injuries and their associations with socio-economic and behavioural factors among school-aged children in the Palestinian Territory. In part II of the discussion (Chapter 8), the results will be reviewed in the light of the findings of other studies. Attention will be given to some possible implications of public policy making and planning.

7.1 The literature review

Published articles that investigated the occurrence of unintentional injury among children and adolescents in the Eastern Mediterranean countries and Israel were identified using an international data index "PubMed". To my knowledge, this is the first review that used a systematic search for the evidence of unintentional injury in the Eastern Mediterranean region and Israel. The Cochrane Collaboration group in the Middle East region highlighted the inadequate research capacity and scarcity of resources in the region. The authors suggested that a review of the existing research evidence in the Eastern Mediterranean region would help in setting the research priorities and improve policies (135). A possible limitation of my search was that I searched only the PubMed; hence I might have missed articles that were published in local journals not indexed in the PubMed. However, my search is less likely to exclude articles that are of high quality.

While I was writing my discussion, I became aware of a data base that indexed articles published in the Eastern Mediterranean countries (136), This data base, Index Medicus for the Eastern Mediterranean Region (IMEMR), is the only data base to index health research and biomedical information based on geographical location, Eastern Mediterranean Region.

It is thought that most of the articles that are indexed in IMEMR are not indexed in the world's leading bibliographic data bases, such as the PubMed. Although IMEMR should index articles published in the Eastern Mediterranean countries, none of the articles that were identified using the PubMed were retrieved when similar search strategy was applied using the IMEMR. In addition, out of 17 articles that were identified when my search strategy was applied to the IMEMR, only two articles were relevant to the literature review (46, 137).

Most of the retrieved studies from PubMed, are based on routine data (i.e. extracted from the police and medical records) to investigate the occurrence of unintentional injuries. The results of these studies were limited by methodological problems. A comprehensive review of epidemiological studies dealing with road traffic injuries in developing countries (138) stressed that children with less severe injury and those who do not seek medical care might be underreported in the medical reports. Furthermore, this review discussed the possibility of misclassification that might result from the subjective assessment of injury by the police officer, for example in describing the severity of injury as "slight" when in fact it could be "severe" or even fatal (138). In order to have a complete data set that includes the distribution of injuries by cause, location, type and severity, systematic recording using the E-code and N-codes was recommended by the authors of this review.

Underreporting of minor injuries is likely to be common in developing countries, reflecting access and cost of medical care. The results of a community based survey highlighted that almost 85% of injuries in Brazilian children were not reported (139). As a consequence of the underreporting of injury cases, the numerator will be small and thus injury rates will be underestimated. In addition, a careful interpretation of studies results that are based only on hospital data should be undertaken. If the size of the catchment population is not known, the injury rate may be under or over estimated. Incomplete reporting of injury might mean that reported injuries may not be representative of either the type of injury, or of the age of people at risk of injury. Of those studies that used mortality data, the majority did not provide details on the age groups (e.g. by classifying the age group into at least 5 standard categories). Lack of age specific data makes it difficult to compare results with those from

other populations. In addition, variations in the injury definitions used by these articles limited the ability of comparing the results of these studies with each other, or even with international results.

Most of the retrieved studies investigated non-modifiable risk factors, such as age and gender, and a few investigated the association between the occurrence of unintentional injuries and modifiable risk factors such as the environment. Most studies used descriptive analyses only to report simple associations with possible risk factors and few studies used multivariable models such as logistic regression. Failure to take account of possible confounding factors may lead to false conclusions regarding the independent association with potential risk factors.

7.2 Methodological issues in the use of Mortality data

Routine injury data could be defined as:

"Data that are derived through ongoing data collection systems associated with health and social services. They are not data collected specifically to answer a particular question."(140)

There are a variety of sources of routine injury data. The most common sources of routine data are: morbidity data such as hospital records and mortality data such as death certificates. The accuracy of these data depends on the level of a country's development, the available resources and infrastructure and technical capacity (141). For example, in some developed countries routine data are presented by social class, in another routine data may be presented by ethnicity, educational level or income. In many developing countries neither ethnic origin, income nor class data might be available as routine data because this information is not reported in the death certificates. Thus the detection of health inequalities within the population is limited by this.

The availability of mortality data as routine data make it a rich and cost effective source of data. To my knowledge, mine is the first study to investigate the causes of injury mortality among Palestinian children. Given the range in the training and experience of the certifiers,

it is likely that there is variability in the way that death certificates are completed. It is expected that the quality of mortality data could vary substantially between the three countries in this study, Palestine, Israel and England and Wales. There are a number of limitations which should be taken into consideration, in particular the quality and completeness of the data reported on the death certificate. Thus the mortality results should be interpreted with caution. For the Palestinian results, the data could either over or under estimate the injury cases as a result of lack of training, experience and awareness among Palestinian physicians on the importance of completing and clarifying the items on the death certificate. This conclusion was drawn based on personal communication with the coder in the Palestinian Ministry of Health who requested to remain anonymous.

The quality of the Palestinian injury mortality data might be questionable, mainly due to variations in coding. For example, when injuries under the ICD-10 code W32-W34, 'hand gun discharge' or 'army refill and machine gun' or 'discharge from other and unspecified firearm', are reported, they are classified on the death certificates as 'accidents', rather than as a result of acts of war or external violence (142). In addition, it is likely that due to social and religious constraints, deaths due to self-inflicted harm i.e. suicide may deliberately be coded to other causes. However, in order to meet the objective of describing the scale of injury and its causes among Palestinian children, the only source of data was the causes given on the death certificate.

In addition, it was difficult to identify the specific age groups at risk of transport accidents, (whether drivers, passengers, pedestrians or cyclists) using the Palestinian and Israeli mortality data, since these data are not available by specific transport modes. The investigation of the impact of the injury problem on premature mortality, years of potential life lost (YPLL) prior to the age 65, was not possible due to lack of data on age-specific mortality. Furthermore, because the current data lack information about social class, it was not possible to investigate whether social class is a risk factor for injury related mortality, or whether social class acts as a confounder in explaining regional differences.

As illustrated in a review published on-line (143), Israeli mortality data are thought to be complete and reliable. However, the use of a single underlying cause of death rather than providing all conditions relating to the cause of death does not allow the full circumstances of injury to be considered (143). In England and Wales, mortality data can be obtained from the national registration of deaths and causes of death, though it is not always accurate (144). The transfer from manual coding of the cause of death by trained coders to automated coding, using an automated cause coding system (ACCS), generated problems. These problems resulted from incomplete or different information being available to the system whereas previously the underlying cause of death was coded manually rather than automatically. Since all deaths classified as injury due to external causes must by law, in England and Wales, be referred to a coroner, the authors suggested that coroners should be trained to accurately report the underlying cause of death in order to overcome this problem (145). Taking these previous listed limitations into consideration, I believe that the incidence of injury mortality in England and Wales would be either over or underestimated.

The results of a study conducted by Colin at al, 2004 discussed the quality of the global data on death registration provided by developed and developing countries to the World Health Organization (WHO). These results indicated the existence of variation of death coverage between developed and developing countries from nearly 100% coverage in developed countries to as little as 10% in some developing countries (146). The results of the previous study also indicated that causes of a sensitive nature were underreported, such as suicide in both developed and developing countries, which is believed to be due to social factors. The results of this study were based on mortality data provided to WHO by member states. While Israel provided mortality data up to the year 2000, no mortality data were provided by the Palestinian authority (146). This implies that no data on injury were available at the time prior to the Intifada.

There is no ideal death certificate, even in the most developed countries. A study conducted by (Lu et al, 2007) using on death certificates in Australia, Sweden, Taiwan and the US showed that there was insufficient information on the death certificate for accurate coding. In spite of the efforts that have been given in these countries to improve the quality of death

certificates, a new investigation of the causes of death coded under X59, "Exposure to unspecified factor", showed that when insufficient information was given in the death certificate, the coder had to assign the death under indeterminate events. This extent of the problem varied between countries (33% in Sweden, 17% in Australia, 13% in Taiwan and 7% in USA) and hence will affect the international comparisons (147).

Another study examined the potential sources of errors leading to miscoding of the manner of death (148). The researchers compared violent injury death reporting by the Oklahoma medical examiner and the vital statistics office. The results revealed overreporting of homicides by the medical examiner system. In addition, underreporting of homicides and suicides and overreporting of unintentional firearm injury deaths was indicated by the vital statistics system. The study concluded that these errors could be avoided through standardization of the definitions and conducting training sessions for the physicians and the coders (148). When the Utah's death certificate and medical examiner data were investigated for the validity of the assignment of poisoning deaths as "undetermined deaths", the results indicated the existence of underreporting of suicide rates, possibly due to cultural, religious, social and medico-legal constraints in reporting the death as a suicide (149).

The reliability of the death certificate was investigated in the forthcoming articles that were conducted by Eastern Mediterranean researchers. Underreporting of the cause of maternal death was predominant in most of the countries that participated in a study conducted by (Chichakli L.O et al, 2000) and a different cause of death was assigned instead of a maternal cause (150). The variation of coding the underlying cause of death between non-medical certifier and the cardiologist led to underreporting of cardiovascular deaths, in a study conducted in Kuwait (151). In Bahrain, when the accuracy of reporting coronary heart disease (CHD) as underlying cause of death in the death certificate was examined, the results revealed that, due to inadequate training of physicians, the death certificate was often incomplete and this resulted in underreporting of the CHD deaths (152). The variation in results, based on using death certificates, between countries is not limited to the

underreporting of the cause of death. In some cases these variations might be related to inappropriate grouping of the injury causes.

Finally, in spite of the fact that routine data could suffer from inaccuracy and inappropriateness, valuable descriptions of health care use in specific population might be obtained from these data (144). Another group of researchers suggested the use of multiple cause of death data rather than a single underlying cause to overcome the variation between countries when injury events are investigated (153). In the Palestinian territory and in Israel injury events are reported based on a single cause of death, the external cause of injury. In order to substitute underreporting of certain injury indicators, some studies have used the capture-recapture methods using more than one source of information to provide more comprehensive information about the injury causes, circumstances and manner (154). This approach is not possible in the Palestinian Territory because of the lack of reliable source of information on injury.

7.3 Methodological issues in the use of morbidity data

Routine data are frequently used to investigate injury morbidity in the Eastern Mediterranean Countries. Due to economic constraints, these data are preferable to conducting an injury survey that will be expensive and require qualified staff and careful attention to implementation in order to obtain reliable data. The established collaboration between the Palestinian Territory with the HBSC gave a good opportunity to investigate the epidemiology of injury among the Palestinian school-aged children. It was hoped that the methods and the design of the current study would contribute towards a better understanding of the size of this problem especially in the light of the limited health data collected at the national level. Moreover it is virtually impossible to collect data at the national level at the present time as a result of the political situation prevailing in the country mainly with the uprising of the second Intifada in 2000.

7.3.1 Study design

A cross-sectional study is relatively inexpensive compared to other study designs and research hypotheses can be generated. The main disadvantage of using a cross-sectional study is the difficulty in establishing a temporal relationship between the exposure and the occurrence of disease, i.e. which came first (155). For examples, the association between serious injury and feeling low every day. As it is not clear whether the injury cause the child to feel low, or was it the child feeling low that led to the injury. In addition, in the present study the prevalence of serious injury was higher among children of low socio-economic status compared to high socioeconomic status, but it cannot be ascertained as to whether the serious injury affected the family's economic status; in other words whether the association with low socio-economic status was a consequence of the child's injury rather than being predictive.

7.3.2 Sampling methodology

The use of a standard sampling procedure, multi-stage cluster sampling, ensured the study was representative (156). However, it should be noted here that due to financial constrains only regular schools, those schools at which either normal or with mild physical disability students were attending, were sampled. Thus the result of the current study would be generalisable to children attending the same type of schools. It is considered that the use of cluster sampling in conflict areas might facilitate the movement of survey team into a more safer areas, which will reduce the cost of the survey (156). However, using cluster sampling, children in the same school may behave more similarly to each other than to children from different schools. This can lead to underestimation of the standard error of estimates, leading to type 1 errors, if not taken account in the analyses. To overcome this problem, clustering by school was taken into account in the analyses by using robust standard errors. Though responses on serious injury were collected from half the Palestinian children in each of the selected cluster, there was no bias in the characteristics of those who were given the questionnaires on serious injury from those who were not. The general characteristics of children in the two samples (sample A and sample B) were similar.

7.3.3 Survey administration

The validity and reliability of the survey instrument and its administration need to be considered in any study. Validity examines whether the relevant questions about the research topics are being asked, and whether sufficient areas are covered. Reliability includes the consistency of information given either due to subject errors, or due to inter-observer variation (157, 158). The reliability of the Palestinian study was improved through conducting training that aimed to minimize the inter-observer variation in experience, and to improve their efficacy in collecting the survey data. A workshop was held to train the researchers on how to implement the survey activities in the field. At the workshop, trainers illustrated practically the implementation activities, and a standard manual was provided to the field team that clarified how to present instructions to students and answer questions about individual items. Prior to finalisation of the questionnaire it was tested by pilot administration in a sample of school children.

7.3.4 Response bias

People who participate in a study may differ from those who do not in characteristics that might influence both the estimates of prevalence and of associations. High non-response of study subjects might introduce a bias that may be difficult to assess. As a consequence the accuracy of the outcome will be affected, for example absence of children due to serious injury. The response rate in this survey was very high (98%), so it is very unlikely that response bias affected my findings.

7.3.5 Missing values

There are different approaches to deal with missing data in statistical analyses and these depend on the nature of the missing data. Missing at random is when the obtained observation is missed by accident (as for example, when a sample of blood is accidentally broken in the laboratory. The other type of missingness is missing not at random, when the missing in the independent variable is related to other factors (159-162).

In the analysis for this thesis, the missing values were handled as follows: first by estimating the percentages of missingness in each of the variables that was used in the

analysis, which varied between 1.5% to 8.8% in the independent variables and 4% in the dependent variable. I then conducted a sensitivity analysis looking at three different assumptions: first, estimating the odds ratios by ignoring the missing values, second estimating the odds ratios by assuming that all the missingness in the dependent variable were positive for the outcome (i.e. seriously injured) and third estimating the odds ratios by assuming that all the missingness in the dependent variable were negative for the outcome. The results of these assumptions showed that there were small differences in the odds ratios but these were of a small amount (reflecting the fact that prevalence of missing outcome data was low). In addition, the sensitivity analysis suggests that these missing were missing not at random.

Given that the level of missing in the variables used in this survey did not exceed 10% (159), I used the complete case analysis approach. In this any variables with at least one missing value will be dropped out from the logistic regression model. This approach is commonly used by other epidemiological studies.

7.3.6 Survey instrument

The self administered questionnaire is one of the data collection techniques that requires filling in the questionnaire by the subject sometimes in the presence of the researcher who may intervene on request. The main advantage of using self administered questionnaire, apart from lower costs, is that they eliminate interviewer effects. This may be particularly important when asking about sensitive topics. In addition, particular environments are targeted to increase the response rate, e.g. as in my study where children in schools were targeted.

Misunderstanding the survey questions can lead to over or under estimation of injury prevalence. To minimize this problem, a student advisor was instructed to respond to questions asked by students at grades 8 and 10, and to read through the questionnaire for students at grade 6. Nevertheless, the scope for misunderstanding is always greater than in well-conducted face-to-face interviews. In addition, using an anonymous tool limited the chances of obtaining any incomplete data from the children. Non response to the

questionnaire may introduce bias in the results. 4.0% of children did not answer the question on injury and other questions were also missing in various percentages.

It is believed that, the responses of children to self-administered questionnaire items might vary according to the degree of privacy they were given when completing the questionnaire. The results of a study conducted in Indonesia highlighted that political party, the fear of teachers and other class mates, mainly in very crowded schools, with very little distance between a child and another, tended to affect the accuracy of children responses (163). Similar issues were highlighted by other studies (164, 165). I hope that the privacy issues will not influence the students' responses reliability in my study, mainly the older children. For the younger students, the reliability of responses could be questionable as the counsellor was used to read through the questionnaire to these children. It is possible that these children might give more socially desirable answers.

In one study, the reporting of feelings and psychological states by children was affected by the mode of administration, with children tending to report more socially desirable responses using pen and paper questionnaires compared to computer based responses (164). In another study conducted in the United States to investigate variation in reporting risk taking behaviour based on the mode of administration, significant differences were found between reporting the carrying of a knife when a paper and a pencil self-administered questionnaire was administered compared to audio computer assisted self-interviewing technique. A higher prevalence was obtained using the latter technique (166).

7.3.6.1 Question used to assess the severity of injury

Though the HBSC question that assessed the occurrence of serious injury among the school children is widely used by studies in other countries that participated in this survey, little attention has been paid to examining the reliability of self-reported serious injury in children. The children were requested to recall their experience of injury over the last 12 months prior to the survey. The children's responses might be affected by recall error, which is of two types: the first is due to problems with memory when the respondent fails to report the occurrence of the event; this is likely to increase with increasing recall period,

leading to an underestimate of injury prevalence. The second is a 'telescoping' effect when a respondent reports an event which occurred outside the recall period, leading to an overestimate of the injury prevalence (167). I consider that recall error is unlikely to affect my findings in any substantial way, since only serious injuries were reported. Results from studies conducted in developing and developed countries suggest a recall period of 1 to 3 months is appropriate when calculating the overall unintentional injury rate, and that a recall period of up to 12 months may be safely used to obtain information on more serious injuries (168-170).

The researchers of a Canadian study conducted to investigate whether data collected in emergency rooms could be used to implement injury prevention strategies for Canadian youth argued that the injury question used in HBSC was a valid measure to assess the occurrence of serious injury among Canadian youth population (171). However, it should be noted that the question used to assess the occurrence of serious injury in this study does not ask directly about the intent, or circumstances of serious injury.

In their review (Beattie T et al, 1998) discussed the use of several scores by researchers to measure the severity of injury within the population. The majority of these scores were derived from the Abbreviated Injury Score (AIS) that is composed by measuring the site of body being sustained to injury. The other score, the Injury Severity Score (ISS) is obtained by summing the square of the three worst injuries to the body site. The Maximum Abbreviated Injury Score (MAIS) is obtained by measuring the single most severe injury to the body site. The Revised Trauma Score (RTS) is derived from three components: the Glasgow coma scale, systolic blood pressure and respiratory rate. And finally the Paediatric Trauma Score is composed of the following indicators: weight, systolic blood pressure, level of consciousness, airway, wound and fracture. As argued by the authors, the first four scores were derived based on the adults' norms while the last score was validated against paediatric data set. In addition, all of these scores can be used to assess the physical injury and not drowning, poisoning or choking (172). However, these are known established severity scores that might be used to improve the HBSC question to better measure the severity of serious injury.

The injury Pyramid is a way to conceptualized the distribution of childhood non-fatal injury in the population where the severity of injury care provided could be presented according to the following categories; hospitalization, attendance in the community (treatment by general practitioner and community nurses) and having the treatment at home (169). However, the HBSC injury question that was used to assess serious injury among Palestinian children was not broken down by these categories and thus it is difficult to compose injury pyramid based on this question.

7.3.6.2 Questions used as potential risk factors for serious injury

Several articles investigated the reliability of various items used in the HBSC questionnaire believed to be determinants of serious injury. The coming sections present these studies. It is known that the lower the reliability of the adolescents' answers to the risk factors, the lower the correlation between serious injury and these risk factors. This might pose a particular problem with regard to questions concerning parental education and occupation and family well off, as the Palestinian children and adolescents might experience some uncertainty as to how they should classify their families' well off. In my study, five indicators were used to assess the socio-economic status of the school-aged children. Apart from the variables that I used to construct FAS, the association between each of these variables and the serious injury was investigated individually and not as a composite set.

A study conducted in the United States tested the validity of self-reported socio-economic status by school children, and found good agreement between children reporting their socio-economic status and that reported by their mothers. However, validity varied with children's age, family structure, school performance and risk taking behaviour (173). A study conducted by Vereecken et al, 2003 reported that children aged 11-12 years were able to report their parental occupation with enough details to be useful in a study investigating socio-economic variation in health and lifestyle behaviour (174).

A study conducted to investigate material deprivation and self-rated health among adolescents in 22 European and North American countries found a consistent association between the FAS and self-rated poor health across the countries. This consistency suggests

that FAS could be used as a reliable measure to reflect the material deprivation reported by the children and adolescents (175). When the validity of the composed family affluence scale (FAS), as a measure of absolute wealth was examined, the results suggested that FAS might be used as a preferable and more consistent measure of parental occupation and education level (176, 177). It should be noted that the items used to construct FAS (car ownership, family holiday, having a computer and having own bedroom) might suffer from limitations. As car ownership and having a computer vary according to rural or urban residency this was not asked about in the Palestinian survey. In addition, having own bedroom might vary according to the family size, age and gender of the child. However, in one study (Candace E. Currie et al, 1997) the authors favour the FAS as a proxy of SES because of inadequate reporting of parental occupation by the children(178).

When the validity and reliability of the item used to assess physical activity in the HBSC study was investigated in an Australian study, the results indicated acceptable validity and reliability for children at 6^{th} grade, while for children at the 10^{th} grade there was more variability (179). The Australian study investigated the physical activity item available in the 1997/98 version of the HBSC study. In the Palestinian HBSC study, physical activity was based on a modified version of the questionnaire in 2001/02, when additional details on physical activity were collected. The results of a study conducted among Norwegian schools by Siren Haugland et al, 2001 indicated a high level of reporting of subjective health complaints by children at the age of 11 years. The reporting of subjective health complaints increased with age, with girls reporting being more significant than boys (118).

As in other self-reported behaviours, the reporting of smoking is affected by privacy and confidentiality (180, 181). Inconsistency in the reporting of the current use of tobacco has been shown in a number of studies (182, 183). The place where the questionnaire was administered also influences the accuracy of response to the smoking question. Using biochemical measures as the gold standard, a study found that children tend to report their smoking habit more accurately when the question is administered to them at the school compared to at home (165). In the same context, the reliability of self reported health risk behaviours by American students who participated in the Youth Risk Behaviour Survey

was examined using a test-retest technique. The result of this reliability study revealed a high reliability of reporting of smoking compared to behaviours such as physical activity and dietary habits (184).

The findings of a cross-sectional survey conducted to investigate the reliability of reporting cigarette smoking by school children aged 8, 10 and 12 years revealed a consistency in the self-reporting of smoking by the children (185). When the reliability of items used by the Youth Risk Behaviour Survey (YRBS) as potential risk factors for the occurrence of injury was tested, moderate reliability was reflected from adolescents who responded "rarely or never wear seatbelt when riding in a car", "participating in physical fight once or more times during the past 12 month" and "carried weapon one or more days during the past 30 days." The provided test of agreements (Kappas) for each of the previously mentioned factors was 61.6%, 67.8% and 65.7% respectively (184).

It should be noted that further risk factors were investigated by other published studies based on HBSC data such as drunkenness during lifetime, cannabis use during lifetime, other illicit drug use, not using a condom during most recent sexual intercourse. However, due to social desirability none of these variables were investigated in the Palestinian survey. Furthermore, it is believed that the use of the anonymous questionnaire would increase the response to the sensitive issues when assessed in the questionnaire. Palestinian children were not asked to report their access to health care, which I believe is important to be assessed in this population, mainly due to the current political situation in Palestine. Access to health care might have explained the variation in the mortality and morbidity results between the Gaza Strip and West Bank. It is known that the quality of health care in the West Bank is much improved than that in the Gaza Strip.

Furthermore, it is believed that the clearness by which survey questions are presented, would affected the accuracy of responses. In the Palestinian survey, only children who reported having serious injury were requested to report on the location, activity and nature of their injury. However, a response of "I was not injured in the past 12 months", was given as an option at the beginning of each of these questions. It is possible that this

unnecessary repetition might lead to confusion by the children. Unfortunately, due to underreporting of injury morbidity cases by the Palestinian medical records, comparison of the finding of this survey could not be made against any other injury morbidity data.

7.3.7 Alternative approaches

Eight items reflecting somatic and psychological health were used to report the subjective health by the Palestinian adolescents. In my analyses the associations between each of these items and serious injury were investigated. However, a composite score of these items could be constructed, but with dropping at least three items. A Swedish study, based on four rounds of data collected from Swedish adolescents, examined the reliability of using a composite score of subjective self-reported health in HBSC (186). The results of this study highlighted inconsistency with the model when the eight items were introduced at once into the model. Furthermore, the results showed that consistency with the model would be obtained if these items were reduced to five. A recommendation from the authors was that the response format of these items should be taken into consideration in order to improve the HBSC questionnaire (186).

7.4 Summary

Injury was inadequately defined, or a definition of injury was not given in articles that were retrieved from the reviewed published research on injury among children in the Eastern Mediterranean countries and Israel. Variability of expertise in completing of death certificates affects the quality of mortality data and may limit the comparisons between Palestinian Territory, England and Wales and Israel (e.g. data obtained from Palestine and Israel were incomplete in regarding to the SES). I have discussed a number of methodological limitations in the use of self administered questionnaires in the HSBC data and how these might affect the results (e.g. temporal relationship can not be assess, question on injury severity does not clear separation for the categories that would help in compromised the injury pyramid).

CHAPTER 8

Comparison with the results of other studies and recommendations for injury prevention

In this chapter I will compare my results with those of other studies that have examined the distribution and risk factors of injury among children. This includes studies from HBSC surveys in other countries, as well as results of other studies conducted worldwide. I will then consider the strategies required for injury prevention in the Palestinian setting.

8.1 Mortality studies

8.1.1 Socio-demographic factors

Gender and region were identified as risk markers for the occurrence of injury mortality in Palestinian children (chapter 3). The mortality rate due to injury in girls was almost half that in boys. Children living in the Gaza Strip were at higher risk of being killed by injury than children living in the West Bank. Across the three countries considered (England and Wales, Israel and Palestinian Territories), road traffic crashes (RTCs) were the most common cause of injury mortality in children aged 0-14 years. The age trend of deaths due to RTCs among youngest Palestinian children was similar to that in Israeli children, where children aged 0-4 years were at higher risk of being killed by RTCs than older children, but the opposite trend was seen in children in England and Wales. The other leading causes that led to deaths in Palestinian children were firearm missiles, drowning and falls, and in Israeli children were drowning and assaults. In children in England and Wales the main causes other than RTCs were poisonings, suffocations and burns.

Boys in Palestine, Israel and England & Wales experienced more fatal injuries than girls. This result could be influenced by risk-taking behaviour, where boys tend to be present where violent events are occurring and they engage in hazardous environments more than do girls. This result agrees with the results of other studies presented in my review (chapter 2), that found the occurrence of injury among boys to be higher than that among girls. If

we take RTCs as an example, my results indicated that injury mortality rates in boys in Palestine, Israel and England & Wales were almost twice than in girls. However, in addition these differences might be related to gender variation in access to economic opportunities and in exposure to road crashes either as drivers or passengers.

The injury mortality rate in children in the Gaza Strip was higher than that in the West Bank. This difference might be attributed to differences in socio-economic status between the two regions. Furthermore, Gaza Strip is considered to be one of the most densely populated areas in the world (it has a population density of 9,000 persons per square mile) (187). In addition, the estimated fertility rate in the Gaza Strip in the year 2008 was 5.51 children born per woman compared to 4.06 children born per woman in the West Bank. The estimated unemployment rate in the Gaza Strip in 2007 was almost twice than that in the West Bank (80% : 46%) (188). My study provides some extra information on the distribution of certain socio-economic indicators. For example, 41% of children in the Gaza Strip compared to 26% in the West Bank reported going to bed hungry, and parental employment was lower in the Gaza Strip compared to the West Bank (35% compared to 25%).

A reduction in injury mortality rates in boys (from 16 to 10 per 100,000) and girls (from 7 to 4 per 100,000) was observed in a Swedish study. This study was conducted to investigate the trend in injury mortality and morbidity in children and adolescents aged ≤ 20 years over the period 1987- 2002. The authors believed that this reduction might be related to the improvement in population social status and to the introducing of a national strategy for safety promotion (189). This reduction was observed in Sweden which has the lowest child injury mortality rate worldwide. The only available Palestinian injury mortality data in children was for the years 2001 to 2003 which is too short a time to reliably investigate trends in injury mortality. The Swedish study investigated mortality from unintentional injuries. Both unintentional and intentional injuries were covered by the Palestinian data, but there were no available data from the death certificate on family socio-economic status.

8.1.2 War related injuries

A review published in 1997 reported that injuries of the lower extremity of the body were the most common war related injuries in civilians across the world (190). The authors found that the war related injuries were related to the increase in explosive weapons in crowded areas such as shelters, hospitals and schools. The authors suggested that along with political efforts, improvement of injury surveillance systems is required (190). In my thesis I report that firearm missiles were the leading cause of injury mortality in Palestinian children aged 10-14 years.

A small Palestinian study conducted to investigate Intifada related injuries using hospital records found that injuries to lower extremities were predominant among children aged 0-14 years, with a proportion of 28.6% of all Intifada related injuries in this age group (191). However, the authors did not describe whether these were mortality or morbidity cases, or the degree of severity of the injuries. In another recent study investigating armed conflict and access to health care in the West Bank, 18% of patients attending the emergency department reported that they had been delayed getting to hospital. Of those admitted to hospital, the proportion reporting delay was higher (32%). The authors concluded that, because of the check points, only persons with serious health conditions seek medical treatment in hospitals (33).

8.1.3 Road Traffic Crashes (RTCs)

RTCs were the most common cause of injury mortality among children aged ≤ 14 years in the three countries considered. Similar results were found by other studies conducted in the Eastern Mediterranean Countries and Israel (40-42, 45, 66). The results of a study that was conducted in South Africa to investigate the trend in injury mortality over the period 1981 to 1985 found that RTCs were the leading cause of injury mortality in children aged ≤ 14 years (192). This shows that even in other countries affected by conflict, road traffic is the main threat of injury mortality in children.

The results of a study that was based on data from WHO data bases showed that the mortality rate in children aged 0-4 years and 5-14 years in low and middle income countries

was six times the rate in children from high income countries. Pedestrians, passengers and cyclists, using multipurpose roads, were found to be the most vulnerable groups (193). A report that was produced by UNICEF highlighted that RTCs are the leading causes of injury mortality in children who are living in the South-East Asia and the Pacific region; this report found younger children are killed as either pedestrians or cyclist, and older children are killed as occupants or drivers (194). I did not investigate the mode of distribution using the Palestinian data, as mode of transportation are not reported in the death certificates.

8.1.4 Other causes of injury related mortality

The other leading causes of injury mortality among Palestinian children were firearm missiles, drowning and falls. However, when I reviewed the leading causes of mortality and morbidity from unintentional injuries among children in the Eastern Mediterranean Countries and Israel, falls and burns emerged as the leading causes. In Iran, a cross-sectional study was conducted to investigate the incidence of unintentional injuries in rural children aged 0-14 years (195). Details on injury mortality were reported using a questionnaire, by health personnel working at the rural health houses. The leading causes of injury mortality were RTCs (37.5%), drowning (17.9%) and burns and scalds (12.1%) (195). In contrast, lower proportions of these causes were reported in Palestinian children with a notable difference for burns (1.7%). These differences might possibly be due to using different ICD codes, as the Palestinian coder used ICD-10 (Chapter XX) whereas the Iranian researchers used ICD-9.

The results of a report that was published by UNICEF in 2004 highlighted suffocation and drowning as the leading causes of injury mortality in infants and children who are living in East and South Asia and the Pacific region (194). My results were partially consistent with the results of this report, as drowning was one of the leading cause of injury mortality in Palestinian children. A published report by the World Health Organization highlighted (23) that, worldwide, deaths from all types of injury are predominant in boys compared to girls, with the exception of fire-related burns that were more common in girls compared to boys. This difference was notable in the Eastern Mediterranean countries. The authors of this

report believed that this result was expected. Cooking, particularly over open fires, is the responsibility of girls and women who usually wears clothes made out of flammable materials (23). My results showed a consistency with the trend of fire-related death injuries observed worldwide with a rate of 0.33 (0.14 to 0.66) per 100,000 girls, and 0.08 (0.01 to 0.29) per 100,000 boys, approximately four times higher.

Israeli mortality data, for the period 1984 to 1992, were analyzed to investigate trends in injury mortality due to external causes (196). The results found that injury mortality in school-aged children (5-14 years) contributed about 25% to 33% of the overall injury mortality in the population. Road traffic crashes and drowning were the leading causes of injury mortality in this age group, consistent with my results. Differences in the trend in injury mortality between Jewish and non-Jewish populations were found. The authors related this to cultural differences, such as suicide rates in Jewish males and females, which were three and four times higher compared to those in non-Jewish males and females respectively (196).

8.2 Non-fatal injury prevalence studies

8.2.1 Socio-demographic factors

In my analysis of non-fatal injury in Palestinian school-aged children I found that, approximately one quarter (26.4%, 95%CI: 24.2 to 28.7) reported that they had sustained an injury requiring medical attention. More boys (33.4%) than girls (20.1%) reported having a serious injury for which they were treated by cast, stitches, operation or overnight hospitalization and needed a long time to be better. The proportion of general injury in children aged 12 years (50.3%) was higher than that in children aged 14 years (44.5%), and in children aged 16 years (38.0%). Children attending the UNRWA schools were at higher risk of having injury than children at the other types of schools. There was not sufficient evidence to say whether prevalence differed between the West Bank and Gaza Strip.

Due to the limitation of studies that investigated injury morbidity among children in the Eastern Mediterranean countries, I will compare my results with the results of studies

conducted elsewhere. My findings showed that a large proportion of school children (60.4% of boys and 48.5% of girls) reported at least one injury requiring medical attention by a doctor or a nurse during the 12 months prior to the survey. These proportions were higher compared to the finding of a study conducted in Maryland USA to investigate the occurrence of injury that needed medical attention in school children, in which an injury prevalence was found in boys and girls of 53% and 38% respectively (197).

In a HBSC study, in Switzerland, boys and girls reported lower injury prevalences, 46.8% and 43.8% respectively, compared to Palestinian boys and girls (198). In another HBSC study, Lithuanian boys reported similar prevalence of all injuries (59.4%) to that reported by Palestinian boys. However, the prevalence of all injuries in Lithuanian girls (40.8%) was lower than that in Palestinian girls (199). A lower prevalence of all injury (53%), compared to Palestinian boys, was reported by Canadian boys participating in an HBSC survey. Canadian girls who participated in a similar survey reported a similar prevalence (47.0%) to that reported by Palestinian girls (200).

A pooling data set from 35 countries that participated in the HBSC study was analyzed and the results showed that, the prevalence of general injury in boys ranged from 33% to 62% and in girls from 19% to 39% (125). Interestingly, despite the fact that the health system and access to health care in the Palestinian territory are different than in these 35 countries, the prevalence of general injury in Palestinian boys (60.4%) was within the range of injury prevalence mentioned earlier, suggesting a similarity in injury aetiology in boys worldwide. However, the prevalence of general injuries in Palestinian girls (48.5%) was higher than that observed in girls in these 35 countries. This might be related to the involvement of Palestinian girls in home work such as cooking, which might expose them to hazard of injury.

In other studies conducted in the Eastern Mediterranean Region, a slightly higher prevalence of serious injury was reported by Lebanese (34.9%) and Omani (35.7%) boys who participated in the Global School-based Student Health Survey (GSHS) (23, 201). In the same survey, Jordanian boys reported a higher prevalence of serious injury (43.1%)

(202). In all the four countries, girls experienced a lower prevalence of serious injury than boys. The prevalence of serious injury among the Palestinian girls was 20.1% and a slightly lower prevalence was reported by Omani girls (18.3%). On the other hand, Jordanian and Lebanese girls reported a higher prevalence of serious injury, 30.2% and 27.2%. In both surveys the most serious injury was defined as the one treated by a doctor or a nurse and needed a long time to be better. Compared to the results from the HBSC study, the prevalence of non-fatal serious injury among the Palestinian children (26.4%) was within the range, but near the higher extremity, of serious injury prevalence (7.5% to 26.8%) that were indicated when analyzing a pool of data set from 12 countries that participated in HBSC (129).

My findings agree with those from other studies that the prevalence of injury among boys was higher than that among girls (64, 76, 108, 129, 169, 203, 204). It is thought that the higher prevalence of reported injury amongst boys is due to behavioural differences between boys and girls (205). In contrast to a finding of a review conducted by Rivara, 1982, where boys were found to experience more injuries in home compared with girls (205), my results indicated no differences between Palestinian boys (9.6%) and girls (9.7%) in reporting the occurrence of serious injury at home. A population-based survey conducted in Syria indicated that more women than men reported injury occurrence in the home. This was considered to be related to the restricted mobilization imposed on Arab women, either due to social tradition, or due to family circumstances in which they are looking after a family (203).

8.2.2 Location of serious injury

In spite of the socio-economic and cultural differences, similar places were reported to be common for the occurrence of injury among Palestinian and Canadian children who had participated in HBSC surveys. These places were the home for girls and the street, school and sport facilities for boys. However, there was a notable difference in the prevalence of home injury reported by girls in both populations with the prevalence of home injury in Palestinian girls almost twice than that in Canadian girls (62% vs 28%). This might reflect the extra family responsibilities that Palestinian girls were involved in, such as cooking and

supervision of other siblings, and the long time spent at home. Another notable difference was in reporting of sport injuries by Palestinian and Canadian boys. Palestinian boys reported a quarter of the sport injuries that Canadian boys experienced (9% and 36%). This might reflect possible variation in exposure and access to sport facilities (171).

Serious injury due to sport activities in Palestinian boys, aged 16 years, was three times that in girls, while no differences were indicated between boys and girls in reporting serious injury due to walking or running. The predominance of sport injury among boys is consistent with another study conducted in Colorado, USA (204). In contrast to my finding, a Canadian study reported a predominance of walking or running related injuries among boys (206). This pattern may be due to boys being more energetic than girls. In this context, studies from Jordan and Israel reported falls as the predominant cause of injury among children. On further investigation, children were found to inhabit incompletely constructed houses, which exposed them to staircase, roofs and gardens without rails or fences (76, 85).

Compared to the Palestinian results, a striking similarity in injury trend was obtained when a combined data set from 11 countries that participated in the HBSC survey was analyzed to investigated injury location and mechanism (107). However, notable differences in the prevalence of serious injury occurrence at home and sport facilities were found. The prevalence of serious injury occurrence in home (26.3%), in children from the 11 countries, was three times that reported by Palestinian children (9.6%), and that of serious injury occurrence in a sport facility (23.7%) in children from the 11 countries, was almost 10 times that was reported by Palestinian children (2.1%). In another study, conducted in Switzerland, when HBSC data were analysed the results showed the more frequent occurrence of sport injury among boys (29.8%) compared to girls (12.8%). Although the difference in reporting of street injury by boys compared to girls was not significant, the prevalence of street injury among boys (17.1%) was higher than that among Swiss girls (198).

A Canadian study found an association between the occurrences of pedestrian injuries in children aged 0-14 years according to the direction of the street. Children using a one way street were 2.5 times more likely to be knocked over by a car than children using two way street. In my study, the street was found to be a frequent place for the occurrence of serious injury in Palestinian boys. Due to the lack of information about mode of transportation and type of street, I could not identify whether these children were injured as a pedestrian or not (207). A notable difference was indicated, as well, in the reporting of injury mechanisms between Palestinian children and children of the 11 countries participating in HBSC survey. The prevalence of injury due to sport activity (14.6%) and biking (6.7%) reported by Palestinian children was almost half than that reported by children in the 11 countries (33.5% and 13.3% respectively) (107). These differences might be related to the possible variation in exposure and access to sport facilities.

8.2.3 Nature of serious injury

The results of my study indicated that fractures, cuts and bruises were the most common types of injury in Palestinian children. A variety of injury types, other than these reported by the Palestinian children, were most common amongst children in other studies (67, 85, 169). The finding of a study designed to investigate injuries in the home among Arab Bedouin children reported a frequent occurrence of burns. The authors suggested that the lack of caregiver supervision may have contributed to the increase in reporting burns by these children, mainly due to mothers being preoccupied by other duties related to the large families (85).

Apart from fractures, cuts and bruises were found to be the most common nature of injury among Scottish children in an HBSC survey (169). Injury leading to cuts among Scottish boys (72.8%) and girls (75.2%) were almost three times that among Palestinian boys (37.3%) and girls (23.6%). In addition, the prevalences of injury leading to bruises among Scottish boys (84.5%) and girls (82.1%) were nearly four times than that among Palestinian boys (22.3%) and girls (13.1%). These differences might be explained by the severity of injury: the Scottish results were based on the association with minor injury while the Palestinian results were based on the association with the most severe injury.

In Oklahoma, a study was conducted to investigate the reliability and validity of applying a risk behaviour tool for children aged 7, 8, 9 and 10 years, who attended schools. For injury history reported by parents, the following types of injury were found to be predominant in children; cuts (36%), sprains (26%), broken bones (18%), burns (16%) and animal bites (21%) (208). The observed prevalence of injury, in the Oklahoma study, might be underestimated if parents tend to report only those injuries which their children were treated for. However, children might also be exposed to minor injury that parents are not aware of. This might explain the similarity in injury types for more severe injuries with those reported by Palestinian children, mainly for broken bones (17%) and burns (19%). The differences in reporting sprains (12%) and cuts (30%) in Palestinian children might be related to the fact that children's behaviour and their access to hazards change with age (209). In regard to animal bites, this was not investigated by the Palestinian study, although personally I consider it likely that if it was investigated, the prevalence would be high.

A population based survey that was conducted to investigate the occurrence of serious injury in urban and rural Tanzanian areas found a predominance of falls in children aged (0-4) and (5-14) years. Cuts were predominant in children aged 5-14 years. Farm work and play were the common activities that led to cuts in children in rural and urban areas respectively (210). In the Palestinian HBSC survey, the questionnaire did not specifically ask about falls; however the cause of some of these injuries was likely to be due to falls.

Furthermore, the Palestinian HBSC survey did not investigate the occurrence of serious injury by the type of residency, whether urban or rural. With a high prevalence of burns (17.6%) in homes, the investigation of the type of residence would help in directing the prevention policy either to the rural or urban homes. However, from my personal observation, I noticed that open fires are used daily in rural, but not urban areas.

8.3 Factors associated with self-reported serious injury (multivariable risk factor model)

In this section I will review the results from the multivariable model (Chapter 6) and discuss these in relation to my conceptual model (figure 4.1, page 118), and to the literature.

8.3.1 Demographic factors

In my study the following demographic indicators were independently associated with the self-report of serious injury in Palestinian children: being a boy and being at younger age. My hypothesis was that a high proportion of Palestinian boys would report injury compared to Palestinian girls. The results of my analysis supported this hypothesis. In the final model, though the confidence interval crosses one, the odds of having serious injury in boys was higher than in girls (OR=1.2, 95% CI 0.99 to 1.6). This result agreed with studies in the WHO report where the rates of injury among boys in the developing countries exceeded girls by 20% and in the developed countries by 50% (23). In univariate analysis I found a significant association between serious injury and age, this association continue to be significant, even after adjusting for all the other variables at the multivariate model. My hypothesis assumed that having serious injury would increase with age but my results showed the opposite, a decreasing odds ratio with increasing age.

Large extended families give the opportunity for children to receive extra supervision from relatives. In one study Greek children from large families, with 6 children or more, were found to be at lower risk of having injury, 0.55 (0.35 to 0.85). The author related this association to the nature of families in this study (211). In my study I had hypothesised that children from larger families would report less injury than children from smaller families. However this was not supported by my results. I also found no association with attending the UNRWA school and living in the Gaza Strip, factors which I had expected would be associated with more reports of injury. Since few children attended the UNRWA school I had low power to detect an association.

8.3.2 Socio-economic factors

In the final model, only relative family affluence, in particularly the response category "average" was found to be significantly associated with reporting serious injury. This was interesting and unexpected, as my hypothesis had been that children who reported low relative family affluence would be more likely to report serious injury compared to children who reported high relative family affluence. It is possible that the response categories were difficult and the more affluent children tended to report the middle choice.

In the Scottish HBSC survey, the associations between socio-economic status, father's occupation and family affluence scale, and the occurrence of serious injury among Scottish children were investigated separately through logistic regression models that were adjusted for age and gender. A positive association was found between injury that required an over-night hospitalization and low paternal occupation (124). However in my study, neither parental occupation nor education, nor poverty nor lack of access to car, nor family affluence was found to be associated with serious injury. Similar results to mine were obtained by another two HBSC studies, as no associations were found between socio-economic factors and the occurrence of injury among Lithuanian children (199), nor among Canadian children (200).

The results of another Canadian HBSC survey found a consistent association between the occurrence of serious injury and the categories of socio-economic disadvantage used in the HBSC survey. Apart from the family affluence scale, significant associations were obtained between "always going to bed hungry" and "being a child of a family not well off" with having serious injury (131). Combined data from 12 countries that participated in the HBSC surveys found a significant association between serious injury occurrence and family affluence. The associations varied according to the type of injury. For injuries caused by biking and skating the association was with high family affluence, while injuries resulting from walking or running and fighting were associated with low family affluence (129). Again, these associations suggest that exposure to risk is the underlying mechanism.

In Newcastle, England, a study that was conducted to investigate factors associated with the occurrence of injury in school children, aged 11 to 14 years, found an association of injury with walking to the place of play outside in deprived children, compared to affluent children, with a relative risk of 1.13 (1.08 to 1.18). In this study, car and telephone ownership were the components of family affluence scale (212). Though serious injury from walking was high in Palestinian children, no association was indicated between walking and family affluence, which was composed from the following items: car ownership, having a computer, having own bedroom and going on holidays.

A one year follow up for the causes of severe and minor injuries occurrence in Greek children, aged ≤ 14 years, showed an association between the occurrence of injury and parental education (211). Children of less educated parents were at higher risk of having injury with odds ratio and 95% CI of 1.37 (1.03 to 1.81). This result supports my hypothesis, as I assumed low parental education would be associated with the reporting of serious injury in Palestinian children. I expected parents of low socio-economic status would be less likely to be able to provide a safety home environment for their children to play, and thus these children would spend their time playing either in the street or at other dangerous neighbourhood.

8.3.3 Social and leisure activities

Of the social and leisure indicators only riding a bike was independently associated with the having of serious injury in my study. This result is expected, as with the greater poverty and increased unemployment, parents are less able to provide their children with safety measures and this would expose them to greater risk of injury. Surprisingly, no association was found between having serious injury and the child's physical activity. The results of a Canadian study that was conducted to investigate the association between physical activity with the occurrence of injury in, and outside the school, found no association between the occurrence of school injury with physical activity at school. On the other hand, there was an association between the occurrence of injury outside the school and physical activity. These results were consistent for severe and non severe injuries. The authors of this study

suggest that supervision and school regulation might play a role in getting these results, but there were inadequate data in the HBSC survey to examine this (213).

8.3.4 Individual health

In my study the following individual health factors were independently associated with having serious injury in the Palestinian children: feeling dizzy, bad temper, feeling nervous, asthma and physical disability. My hypothesis was that children who report that they frequently suffer from each of these symptoms would be at higher risk of having serious injury. Children who reported they were frequently bad tempered were less likely to report serious injury, but all other health variables given above were significantly and positively associated with reporting serious injury. In contrast the following individual health factors failed to support my hypothesis: headache, back ache, stomach ache, feeling low, sleeping difficulties, and suffering from diabetes.

The ill health in Palestinian children might be influenced by the unstable political situation that they are exposed to; the results of the following Palestinian studies support this assumption. A Palestinian study in school children, living in Ramallah district in 2003 reported an association between a feeling of being humiliated by the Israeli occupation and the reporting of subjective ill health (214). In addition, a longitudinal study conducted in the Gaza Strip in 2000, found an increase in depressive health symptoms and post traumatic stress disorder which was linked to Israeli violence (215).

A study conducted in the Gaza Strip in 2001 examined the effects of exposure to political violence and found that both exposed and non exposed children reported anxiety symptoms (216). The results of another Palestinian study in women living in the Al-Ein refugee camp in Nablus on 2002 indicated poor housing conditions, overcrowding and poor economic status as constrains of poor health consequences, in particular home accidents, among women (217). There is little literature on the association between individual health factors and injury in other countries. The results of a Finnish study, in adolescents aged 12 to 18 years, found that physical disability was significantly associated with having serious injury, a similar finding to my study (127).

Behavioural disorder problems were not addressed by the Palestinian HBSC and these may be associated with the occurrence of injury. A Canadian study investigated the association between child behaviour disorder (CBD) and the type and cause of injury in children aged < 19 years who were resident in British Columbia (218). Prescription of methylphenidate was the indicator by which children were defined as having CBD. Children with CBD were at 1.5 times the risk of having any of the investigated injury type and cause compared to children without CBD. This result remained constant even after adjusting for age, sex, SES and region (218). This suggests the importance of investigating behavioural problems as a determinant of injury, and to consider this in any prevention programme to control injury occurrence.

Disability is another factor thought to be associated with having injury. Nearly 34.7% of the Palestinian children, who reported having a physical disability, reported a serious injury. No information was available on the degree or type of physical disability in the Palestinian children, but is unlikely to be severe as they were not in special schools. Injury in pupils with cognitive and physical limitations, aged 3-23 years, who attend special schools in Los Angeles was followed up from 1994-98 (219). Any injury that was reported to cause physical trauma to the disabled pupil during her/his presence in the school was investigated. The results showed an increase in injury in multiple disabled pupils compared to those with developmental disabilities [OR=1.7, 95% CI 1.3 to 2.3]. More than 25% of injuries were caused by sport activities, of which 21% occurred either in the playground or athletic field (219).

8.3.5 Risk taking and social behaviours

In my study, of the risk taking and social behaviours that remained in the final model, the following factors were significantly associated with reporting serious injury among school aged children in the Palestinian Territory: being bullied, and fighting. These results partially support my hypothesis, however for other variables neither smoking nor carrying a weapon were significantly associated with having serious injury. These results could be explained as due to the stress that these children are going through, they express their stress

either due to political or bad socio-economic status by fighting with other children or by bullying other children.

Additionally, such behaviour could be explained by the fact that the sample included children at different stages of adolescence when psychosocial, environmental and biological changes occur. It is believed that at this stage adolescents start to be deattached to their families into building their own social network. This engagement in new peer relations might influence the adolescents' behaviour either positively or negatively. The effect of this influence would be greater on adolescent with early puberty, who might be engaged in peer relations with older adolescents (220). Other studies used the HBSC data reported on having an association between variables used to assess violence and having serious injury. The Palestinian results in part meet with the results of these studies that are presented in the following paragraphs.

The Canadian HBSC study examined the association between a protective social environment and the occurrence of serious injury using a factor analysis model. The result of this study revealed that, regardless of a supportive home environment, once the child decided to engage in multiple risk behaviour this increased the probability of a serious injury. Risk behaviours that were investigated in this study were smoking and non-use of seatbelts (221). The results of a univariate analysis for the association between risk taking behaviours and the occurrence of injury among Lithuanian children found significant associations between the occurrence of injury and the following risk taking behaviours: smoking, participating in physical fighting and being bullied (199).

The results of a cross-national study based on HBSC data showed strong associations between the occurrence of serious injury with physical fighting and carrying a weapon. The authors suggested that adolescent violence is universal and might include a side effect on health such as being injured (222). Based on data obtained from the Canadian HBSC survey, two scores of lifestyle and psychological risks were developed using factor analysis. The association between these scores and the occurrence of spinal cord and head injury was examined using logistic regression. The results indicated a strong association

between risk taking behaviours with the occurrence of head and neck injuries. The authors concluded by emphasizing the importance of the role that risk taking behaviour would have in prevention (133).

A pool of data that was obtained from 12 countries participated in the HBSC survey was analysed to investigate the association between serious injury and risk taking behaviours. The results were adjusted for age, gender and socio-economic status, and indicated the presence of a consistent strong association between the occurrence of non-fatal serious injury with smoking and not using a seatbelt in all of these countries (126). Unfortunately, using a seat belt was not assessed in the Palestinian HBSC study, and this limited the chance to investigate whether it is associated with reporting of serious injury by these children.

Based on data obtained from the Canadian HBSC survey, two scores of lifestyle and psychological risks were developed using factor analysis. The association between these scores and the occurrence of spinal cord and head injury was examined using logistic regression. The results indicated a strong association between risk taking behaviours with the occurrence of head and neck injuries. The authors concluded by emphasizing the importance of the role that risk taking behaviour would have in prevention (133).

A Canadian study was conducted to investigate whether wearing protective gear would alter children's behaviour with respect to risk behaviours (223). One hundred children, aged 7-12 years, were randomly selected to participate in this study. The behaviours of each child were assessed with and without wearing the safety gear. An increase in risk taking behaviour was observed when children wore the safety gear. This increase was notable in children with high sensation seeking behaviours (223).

8.3.6 Factors associated with having serious injury by location

My results showed that girls were more likely to report the home as the place of serious injury. This may be because Palestinian girls usually help in household work, and with family overcrowding, might be more exposed to home hazards for example when cooking.

However I did not have sufficient information to probe the causes and reasons for serious injury in the home or at other locations. Palestinian boys were more likely to report serious injury in the street and at a sport facility. These results might be explained by the social discrimination in the Palestinian community, where boys are free to spend time outside the home, but not girls.

Children studying at the UNRWA schools were more likely to report serious injury in the street, while children studying at the private schools were more likely to report serious injury in the home. These differences may be partially explained by the socio-economic status of the family and the area where the child is living. Children who are studying at the UNRWA schools usually come from very poor refugee families, where most of their homes open directly on to the street. In contrast children studying in private schools usually come from relatively affluent families and usually live in affluent areas. Poverty, assessed by a positive response to the question on going to bed hungry, was associated with reporting serious injury at home. This result might indicate that these children are living in incompletely constructed houses and this would influence negatively on their safety.

Riding a bike was found to be associated with reporting serious injury both at home, and in the street. This result probably reflects the different patterns of bike riding by boys and girls which are influenced by the culture of the Palestinian community. Girls are not allowed to ride a bike in the street but can do so in or around their family house. Additionally, it is normal to find young children mainly boys riding their bikes on street with the increased risk of being injured by a car. In the absence of recreational places where Palestinian children could spend their time, the street is an alternative place for play and social activities. Similarly a significant association was found between spending time out with friends and increase reporting of serious injury in the street.

Feeling low was significantly associated with the reporting of serious injury at sport facility. This finding was independent of other factors such as physical problems and bullying. Depression may also lead to aggressive behaviour but in my study controlling for "bad temper" did not change the result. This is a finding that requires more research in

order to clearly understand the complex pathways between mood, and injury especially in situations of conflict. Interestingly, children who reported having physical disability, e.g. severe ear or eye impairment, were more likely to report serious injury in the street. This result might reflect the fact that streets in the Palestinian Territory are not built to be friendly to the use by physical disabled children.

Fighting was indicated to be significantly associated with the reporting of serious injury at home and the street. These are expected results, as the majority of Palestinian houses are overcrowded, leading to a limited space for children to play and might lead to fighting between siblings. In a way to find alternative places to spend leisure time, Palestinian children (in particular boys) choose the street. This may increase the possibility of fights with other children.

The results of a cross-national study that was conducted by pooling HBSC data from 25 countries to investigate the association between injury occurrence and socio-economic status, showed a significant association between sport injuries with high family affluence score. Significant associations were also found between poverty and the occurrence of injury in the street, and while participating in fighting (125).

8.4 Recommendations for future research

8.4.1 Improve reporting of injury

With the ongoing conflict in the Palestinian Territory, good efforts have been made to improve the reporting of conflict related injuries. However, more effort is required to improve the reporting of non-conflict related injuries and the circumstances in which they occur. The HBSC survey investigated the injury problem in certain aged 12, 14 and 16 years. However, injury is a national problem, where other age groups are also affected. Thus in order to tackle it, reliable data on the numbers, types and circumstances of injury are needed. The effective method to obtain these data is by establishing an injury surveillance system. Such a surveillance system would require collaborative cooperation between organizations that aimed to prevent injury occurrence.

8.4.2 Improve accuracy, reporting and coding of external causes of injury

Accurate mortality data are essential to describe the extent of the injury problem, and to direct prevention policies towards eliminating or reducing the occurrence of the leading causes of injury mortality in Palestinian children. As highlighted in chapter 7- Section 7.2, Palestinian mortality data are limited by inaccuracies in injury reporting and coding. More attention needs to be directed to increase the knowledge of physicians about the importance of reporting and completing the death certificate data including the underlying cause of death.

Coding of death certificate data could also be improved through training and standardisation. Currently, there are two persons responsible for the coding of death certificates in Palestine, one based in the West Bank and the other in the Gaza Strip. Training should be provided in using the standard international coding system. Where difficulties are met by coders because of inadequate information on the death certificate, this information should be communicated to the responsible official at the Ministry of Health so that they can be made aware of the level of poorly completed death certificates. It might be useful for the Palestinian Ministry of Health to consult with the Egyptian Ministry of Health, where an injury surveillance system has been implemented since 1999, with continuous upgrading to meet with the international system development (224).

8.4.3 Modify the hospital administrative system to assign designated injury codes (ICD-10)

Most of the retrieved articles on unintentional injuries in children in Eastern Mediterranean Countries and Israel (chapter 2) were based on data from hospital records, but problems such as representativeness and ascertainment of the injury occurrences might influence the results of these studies. ICD cause of injury codes could be incorporated into the hospital administrative software to improve reporting and to facilitate the routine collection of injury information with details about the mechanism, intent, location and activity at the time of injury (225). This would enable the Health Information Centre at the Palestinian Ministry of Health to run periodic quality controls on each hospital data set to ensure consistency in completeness, specificity and accuracy of ICD cause of injury codes, in

addition to using these data for analysis. Hospital based injury data would help in designing prevention policies, and could be used to investigate health care cost associated with each cause of injury. In addition, these data (without confidential identifying details) could be made available to injury researchers.

8.4.4 Improve the injury module in ongoing Health Behaviour in School-aged Children Survey (HBSC)

There have been several longitudinal surveys established to investigate health problems in school-aged children; examples of these surveys are given below. The Youth Risk Behaviour Survey (YRBS) investigated health related issues in American children, aged 9 to 12 years. Injury in YRBS was investigated as a consequence of attempted suicide. Circumstances surrounding serious injury were investigated in two school based surveys. The Global School Based Student Health Survey (GSHS), targeted children aged 13 to 15 years attending schools in each of the following regions: Africa, Eastern Mediterranean region, Latin America and South Asia. The other study is the Health Behaviour in School-aged Children (HBSC). In the UK, children born during the period 1 April 1991 to 31 December 1992 were studied by Avon Longitudinal Study of Parents and Children (ALSPAC) (226). Parents of the children, who were alive after their first birthday, were asked to complete a questionnaire regarding the health of their children which included details on injury circumstances (226).

In all of these surveys, injury was investigated as a part of other health conditions, obviously due to cost effectiveness. While HBSC is a useful survey to provide basic injury data that are necessary for the setting of prevention policies, it is not sufficiently detailed. The HBSC questionnaire could therefore include farther questions about circumstances, e.g. falls, use of safety equipment, and use of health care services. Improvements could also be made to the design of the questions on injury in the HBSC tool, for example the repeated response option "I was not injured" in each of the items that measured the circumstances of serious injury might confuse the children leading to either under or over reporting of the injury problem.

8.4.5 Further research

Research in the following areas would give further clear ideas about the situation of injury in the Palestinian children and help in improving any suggested prevention actions.

1- A study is needed to determine more precisely how sociocconomic indicators are related to the causes of injury mortality, for example poor access to health care, unsupervised play in the street and overcrowded households.

2- HBSC could be run in special schools to investigate injury within the vulnerable group of disabled children.

3- The results of my study indicate that a high percentage of injury occurred at school. To have better regular information about the circumstances of these injuries, a special form could be introduced in the schools to be completed with details of injuries at school. These forms could be sent to the school health department at the Ministry of Health for analysis.

4- Environmental hazards in each of the home, school and sport facilities could be investigated further by descriptive research.

5- There is a need to conduct population based research investigating injury in other age groups, mainly children under five years and the elderly who are believed to be the most vulnerable groups for injury occurrence.

6. Many routinely collected statistics do not provide information on the population at risk. For example, pedestrian accidents in children lack detailed information on the number of children making such journeys, the distance involved and the length of time "exposed". While these data could not be part of routine data collection, special surveys could be conducted to better quantify the risk.

7- An evaluation should be considered of the cost effectiveness of some of the prevention actions suggested earlier. Such an evaluation could be done at an early stage in a few pilot locations before applying the programme to the whole population.

8.5 Recommendations for prevention policy and practice

Worldwide, several prevention actions had been proposed to protect children from the occurrence of injury. These actions have been based on the results of studies with respect to locations, activities, and causes. Since each community has its own specific characteristics, not all of these proposed prevention actions could be adopted into the Palestinian environment.

Based on the burden of injury mortality and morbidity demonstrated in this study, prevention actions in the Palestinian Territory should prioritize reduction in mortality caused by RTCs, falls, firearm missiles and drowning. For injury morbidity, prevention measures should consider action strategies for serious injury at different locations; home, school, street, and sport facilities. Prevention measures should consider as well action strategies for serious injury by different activities; biking, sport activity, walking, and fighting. On organizing these sections on suggestions to prevent injuries in school-aged children, I followed the structure of a recent report that was published by the WHO at injury prevention (227).

8.5.1 Legislation and enforcement

According to a newly published report by WHO, the ease of enforcement of legislation is varied between countries. Lack of resources is a further constraint in imposing new legislation in the developing countries (227).

It is the responsibility of the municipality to ensure that the school building is safe and regular inspection for safety should be mandatory with a warning to schools, when required, that they face closure if recommendations for improvement are not met. Children should not be allowed to play sport without wearing the appropriate safety equipment.

There is a need for law enforcement regarding the use of seat belts and to observe speed limits in public areas as well as near to the schools. Furthermore, there is a need to enforce checks on the safety of vehicles where any vehicles that do not pass the annual roadworthiness check should be refused permission to be driven on the road. Only new swimming pools with a fence surrounding it and a self latching gates and a rescue guard should be given a permission to operate. There is a need to enforce laws that prohibit the inhabitation of a newly incomplete refurbishment houses. To prevent death from firearm missiles, the international community are required to boycott the military manufacture companies.

8.5.2 Product modification

There is evidence that injuries in developing countries were reduced when the manufacture of certain products were modified. A reduction in poisoning from paraffin ingestion was achieved when families from South Africa started to use free distributed child-resistance bottles to store paraffin (228). In Guatamala, when a modified wood-burning stove was introduced, a reduction in burn and scald cases in children was seen (229). Though neither burn nor poisoning were the leading causes of injury mortality in the Palestinian children, the introduction of these modified products should reduce the existence of injury cases due to burns and poisoning. Additionally, to reduce the injury mortality in the Palestinian children due to falls, staircase railings and window barriers with narrower gaps could be introduced to avoid children falling down.

8.5.3 Environmental modification

A published meta analysis found that the use of traffic-calming schemes, as intervention measures to reduce road traffic crashes, were effective (230). On the other hand, the results of another review indicated insufficient evidence that modifying the home environment would reduce injuries (231). In the developing countries, no study was found that investigated whether modifying the environment would be an effective intervention measure. This might be related to the fact that these types of interventions require resources, which are scarce in developing countries. Nonetheless Palestinian child injury

that occur in home, school, street, and sport facility environments, in addition to drowning, could be reduced or prevented by improving the environments.

The following proposed intervention actions might be useful: annual reporting of school based injuries and maintenance of equipment and facilities in schools. If costs permit, schools should follow international regulations for surfaces around play grounds and similar locations (for example rubber is preferable). Improvements to the home include completion of house construction (currently many houses in Palestine are not complete and provide a dangerous environment), attention to stair cases and windows, type of flooring, locked cupboards for storage of hazardous materials (such as toxic substances, matches) and sharp equipment out of the reach of childrens' hands.

Fire extinguishers should be placed in private and public places. Whenever, the houses are opened directly to the streets, barriers should be built in front of these houses to avoid the rushing of the children into the street. Streets should be constructed that are friendly for human use with separate pavements for pedestrian, and cycling paths, clearly marked by a sign of children in the road. Pedestrian crossings should be introduced near to each school, and speed humps should be built to reduce the speeding cars, the latest was find to be effective in urban areas in Ghana (232). Recreational areas for children should be built, in addition to improving the road lighting. Children should be supervised in the playground including they are using suitable age related equipment and any unpleasant behaviour is controlled.

To prevent drowning, all pools should be completely surrounded by a fence with a self closing and latching gate. The effectiveness of using a pool fence as a protective measure from drowning in children aged < 14 years was evaluated by a systematic review (205). The review showed that, a pool fence is efficient in reducing the risk of drowning in children, mainly if there no access to it from home. The authors recommended the need to enforce legislation that would require the isolation of all pools from other properties either private or public, with a fence and self-latching gate (205). In addition, a swimming guard should be allocated in each of the public swimming pools and areas including the sea.

Local municipalities should monitor construction of holes (e.g. during construction work) to avoid the collection of water in holes and their used for swimming by children.

8.5.4 Supportive home visits

The aim of this programme is to prevent injuries by improving the home environment. This programme could be carried out by a nurse, who visits homes, observed hazards that might lead to increase injuries in children, and advise mothers how to avoid their children getting hurt. It could be conducted, as well, by a technician or a researcher, who visits homes and demonstrates the correct way to use protective devices such as the hot water regulator. When the effectiveness of using this programme was reviewed, the results revealed that this programme is very efficient at reducing child injuries (233). This result supported the result of another review, where the number of unintentional injuries was reduced following home visits that were focused at improving the quality of home environment (234). This programme could be evaluated in the Palestinian community for benefit and cost-effectiveness.

The authors of the review suggested more studies were required on home injury due to limited information on their benefit of the preventive interventions used (235). In Nottingham, a case-control study was conducted to evaluate the acceptance of providing three injury prevention interventions; free home safety checks, low cost safety equipment and free first aid training to the families of children with an increased risk of unintentional injuries (236). The results of this study indicated that home safety checks and low cost safety equipment were more favoured by the children's families compared to first aid training. The authors related the reluctance of parents to request first aid training to the ineffective presentation methods (236). My results showed that many injuries occur in the home. Homes visits might therefore be a useful intervention to draw the attention of the child caregiver to the hazards that are present in the home.

8.5.5 Safety devices

The proper use of safety devices would lead to a decrease in injuries and their severity. The results of a review on using safety devices in South Africa indicated a reduction in bicycle

related injuries when wearing a bicycle helmet. A further reduction was obtained in car occupant fatalities when using a seat belt (237). As illustrated below, the safety devices are varied according to the type of injury.

Child restraints; these devices are varied according to the stage in child development. In general, the use of these devices is effective. However, the effectiveness of these devices is reduced if using a child restraint does not fit with the child's age. Child restraints are more common in developed compared to developing countries (227). Seat belts; this device could be used for children aged over 10 years or for those at the height of more than 150 cm.

Bicycle helmets; designed to protect the head of the child at the event of crash, or falls. Choosing of a helmet that is suitable for the child age and fitting the head would increase the effectiveness of head protection. Conspicuity; "Is the ability of a road user to be seen by other road users" (227). This is achieved by wearing fluorescence clothes to be seen by others, switching on street lights during the day time, mainly in winter, and using a mirror near to steep curves in the road so on-coming cars may be seen more easily. Personal flotation devices; though it is effective on preventing drowning is not tested yet, however it could be used by unskilled children on swimming. If wearing the suitable device, it is believed that the child would float for a reasonable time that is enough to be rescue.

These safety devices require a mixture of approaches, law enforcement, accompanied by health education and media advertisements. Similar results to these that were obtained by a Chinese study might be shown among the population in the developing countries. The Chinese study found that none of the people who died due to cycling injuries were wearing a bicycle helmet (238).

8.5.6 Education, skills, and behaviour change

There is a debate about whether education, by itself, is an effective intervention to prevent injury. Traditionally, children and their parents are the main target of the educational programmes aimed at preventing injuries. However, to get more efficient outcomes, these

programmes should be expanded to include health professionals, policy makers, the media, and the business community (227). These programmes usually focus on teaching the rules of the road, without paying attention to the child behaviour and developmental stages (227).

One of the intervention programmes thought to be effective and not costly is a multi-disciplinary education approach, involving paediatricians, school health educators and media for public education campaigns. This approach was suggested by the authors of a study conducted in Boston to assess the knowledge of school children, aged 10-12 years, regarding protective measures that would decrease the leading causes of injury mortality in these children. These leading causes were RTCs, drowning and fires. A short questionnaire of seven items was used for this purpose (239). In my study, 3.7% of children reported having a serious injury in the street. Serious injury in the street was found to be associated with the seat belt being used, and with wearing a bicycle helmet. However, no information is available on how these children behave as pedestrians.

The effectiveness of "Risk watch", a school-based prevention programme, was evaluated by a study conducted in Nottingham, UK (240). It aimed to assess the knowledge and behaviour of primary school students on fire and burn prevention, poisoning prevention and bike and pedestrians safety. At the start of the study a questionnaire was administered to children by teachers and at follow up, role-play was used to enhance safety skills in the intervention group. The results of this study demonstrated the effectiveness of the programme in increasing the children's knowledge and behaviour towards the investigated countermeasure (240).

Another prevention school-based programme was evaluated by a study that was conducted in Oxfordshire, UK. In this study, primary and middle school children were assigned in two groups: the intervention group that received the Injury Minimization Programme for School (IMPS), and the non-intervention group. At baseline, both groups had similar knowledge about safety measures. However, at follow up, a notable increase in the knowledge of the intervention group was observed, suggesting that IMPS is an effective prevention programme (241). These prevention programmes are good examples of

programmes that could be integrated into the school curriculum in the Palestinian Territory for educating children about the safety measures that should be taken in case of accidents. These programmes are likely to be economic and effective. I personally, at my primary school stage, was exposed to a programme funded by the government that aimed to increase the safety knowledge of crossing the road, over a six months, a weekly lecture on road safety was given to us by a policeman. Unfortunately, this programme was stopped due to political reasons.

When safety education for pedestrians was systematically reviewed, the results revealed improvement in behaviours and attitudes without reduction in injury cases (242). Giving instruction about swimming and teaching the child how to swim is thought to improve swimming skills and to be protective against drowning (243). However, caution should be taken when giving mass education programme, where it is believed to raise the confidence of the child while swimming that may raise the risk of drowning (244).

Educational interventions directed to the parents of the child, with an aim to prevent injuries from falls, are thought to be practical (227). These programmes can be updated with any new information regarding improvement in devices, e.g. baby walkers that would reduce fall injuries. In addition, educational interventions find to be effective in improving the home environment to be safe against falls. However, there is insufficient evidence that these programmes would decrease injury rate due to falls (227).

A systematic review on social deprivation and the prevention of childhood injuries identified two types of approaches; one targeting a single strategy such as home or road, and the other targeting multiple strategies (235). The studies in the review used a wide range of methods and definitions to measure and describe social deprivation, which limits the generalization of the results from one context to another. The review found that changing the knowledge and behaviours of children and parents was a more effective strategy than modifying the environment, leading to a positive reduction in street injury cases. For home injury, the studies focused on individual interventions, such as the

distribution of low cost safety devices (e.g. cupboard locks, electric socket covers, window guards and water temperature regulating).

The HBSC surveys focused on assessing the relationship between risk taking behaviours and serious injury. Other behaviours such as attention, activity and sociability were found to be associated with repeated injuries in children aged 7 years living in Dunedin, New Zealand. These behaviours and others were measured using the Rutter Child Behaviour Scale A, for parents, and child behaviour scale B, for teachers (245). It would be worthwhile, with the extensive use of Rutter scales in the Palestinian Territory (246, 247) to conduct a study that aimed to investigate the associations between these behaviours and repeated injuries in children at an early school age. This might increase the understanding of the association between childhood aggression and any other behaviours, as well as injury to help formulate preventative strategies.

Health education could be used to introduce Palestinian children to the hazards that are present in their school environment, with advice on injury avoidance. Health education could be held by either the school or the health centres to introduce the parents and children to the hazards in homes, and how to protect their children from being injured. Free emergency first aid training could be provided for teachers and sport trainers. An explanatory pamphlet could be distributed to the parents that include steps to follow in the case of injury. Some examples of what could be included in the pamphlet and training are given below. In case of using portable gasoline heater, parents should not allow children to play near these, and these heaters should not be used for cooking or boiling water. Children should not be left alone in the house, or with other immature siblings.

Parents should be warned not to use matches near to a portable gas tank, and to keep the gas tank in a closed box outside the house with continuous checking and replace it immediately in case a leaking is discovered. Parents should be advised not to let young children to warm or cook food without the supervision of an adult or to ask young children to clean the water tank without the supervision of an adult person, and in case there is a water reservoir in the home, parents should insure that it is locked. The media and other

agencies could also assist in promoting knowledge about ways to avoid injury. A multi-disciplinary education approach to improve the Palestinian children's knowledge about how to behave in the street, with an emphasis on children using the protective measures might be beneficial and could be evaluated.

8.5.7 Community based studies

The Safe community model is a programme recommended by the WHO to reduce the injury occurrence in the community (248). The theory behind this programme is to involve the community in decisions that would be taken regards the proposed interventions. This programme is applied through the following five stages: The first stage is to investigate the epidemiology and economic consequences of injury and local social structure. The second stage is to approach the relevant local and national bodies (such as ministry of health, municipal board, political committees and management groups) to take over the responsibility of the programmes, with the appointment of a facilitator to co-ordinate planning and activities across these groups. The third stage is when all proposed intervention policies are introduced by the facilitator to the action group, comprising a cross-section of the community population, professionals and lay people. When improved, it could be released into the community through the media. The fourth stage is the integration of the intervention policy through the community network and the withdrawing of the facilitator. The final stage is the evaluation stage, when the effectiveness of the programme to reduce injury occurrence is assessed (248).

The effectiveness of the Safe community model was assessed by a case-control study conducted in Östergötland in Sweden. Positive results towards the reduction of injury were obtained; this reduction was by 13% and 15% for injuries treated in health care centres and hospitals respectively. However, the researchers concluded that for this programme to be effective, all the previous listed components should be implemented (248). Since no extra budget was needed to implement this model into the community, this safety community programme would be a useful prevention programme to reduce the occurrence of injury in the Palestinian children, and could be adopted by the Palestinian Ministry of Health.

In their conclusions, the authors of a systematic review of the literature that evaluated community based prevention emphasized that the effectiveness of these programmes in enhancing the culture of safety was the repeated prevention message, and the importance of enthusiastic leadership and organizations' cooperation. Yet, to target any risk factor by intervention, reliable and valid data are required providing clear evidence of association between the risk factor and the occurrence of injury (249). For example, in my study, strong associations were indicated between serious injury and bullying, and fighting. Worldwide, there is increased concern to control violence (250) and this is an appropriate time for the Palestinian Territory to consider the types of research required to better understand and address the causes and consequences of youth violence. Though safe community programmes are widely used in the developing countries, there is as yet no study found to investigate its effectiveness (227).

8.6 Conclusions

For the designing and implementing of effective injury prevention actions, accurate information on the burden of injury problem in the Palestinian children is essential. It is likely that the public health benefits will substantially outweigh the estimated economic costs of improving the recording of mortality and morbidity data. To have effective results from these suggested prevention actions, collaboration within and between governmental and non-governmental agencies and community groups to stimulate national discussion on improving school childrens' safety is required.

8.7 Dissemination plan

The following actions are planned in order to disseminate the results of my thesis, locally and internationally. A brief executive summary of the results will be written and sent to national agencies, e.g. School Health Department at the Palestinian Ministry of Health, and to the local office of UNICEF. In addition, the summary will be sent to international agencies, e.g. Violence and Injury Prevention and Disability (VIP) group in the WHO, and to the WHO-Eastern Mediterranean Regional Office (EMRO). A copy will also be sent to the World Bank who may be involved in funding prevention programmes.

Publications will be another way that I will disseminate the results of my thesis. Based on my analysis of mortality data (chapter 3) an article was published in the Eastern Mediterranean Health Journal, (please see Appendix 2 for a copy of this paper). Another two manuscripts, based on my analysis of the HBSC data (Chapters 5 & 6), were submitted for publication (entitled "Prevalence of serious injury in Palestinian school children" and "Factors associated with serious injury in Palestinian school children: Findings from the national study of Palestinian school children (HBSC-WBG2004)"). A further paper planned will be focused on "Are risk taking behaviours a determinant of the occurrence of serious injury in the Palestinian school-aged children?"

Conference presentations will be a further way to disseminate the results of my thesis. I was able to present my results on factors that are associated with the occurrence of serious injury in school-aged children at the 9th World Conference on Injury Prevention and Safety Promotion that was held in Merida-Mexico in 2008. Two of my abstracts were published in the book that was produced by the committee of this conference (please see Appendix 2 for full copies of these abstracts). In addition, I am looking forward to present my results, if my abstract is accepted and I manage to secure a fund, at the First Regional Conference on Injury Prevention and Safety Promotion that will be held in Cairo-Egypt (date to be confirmed).

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APPENDICES

APPENDIX 1 Questionnaire B of the HBSC study used in the Palestinian Territories, 2004

Demographics

M1 Are you a boy or a girl?

1 ☐ Boy

2 ☐ Girl

M2 What class are you in?

1 ☐ 6th Grade

2 ☐ 8th Grade

3 ☐ 10th Grade

4 ☐ 12th Grade

M3 What month were you born?

1 ☐ January

2 ☐ February

3 ☐ March

4 ☐ April

5 ☐ May

6 ☐ June

7 ☐ July

8 ☐ August

9 ☐ September

10 ☐ October

11 ☐ November

12 ☐ December

M4 What year were you born?

1 ☐ 1985

2 ☐ 1986

3 ☐ 1987

4 ☐ 1988

6 ☐ 1990

7 ☐ 1991

8 ☐ 1992

9 ☐ 1993

5☐ 1989 10☐ 1994

I1 Where were you born?

1☐ Israel

2☐ West Bank

3☐ Gaza Strip

4☐ Jordan

5☐ Gulf states

6☐ Other, please specify_____

I2 Are you?

1☐ Jewish

2☐ Muslim

3☐ Christian

4☐ Druze

5☐ Samaritans

6☐ Other, specify_____

I3 Is your family?

1☐ Religious

2☐ Traditional

3☐ Secular (non religious at all)

Eating and Dieting

How often do you have <u>breakfast</u> (more than a glass of milk or fruit juice)? Please tick one box for <u>weekdays</u> and one box for <u>weekend</u> (off school)

**** M5** **<u>During the week</u>**

1☐ I never have breakfast during the week

2☐ One day

3☐ Two days

4☐ Three days

5☐ Four days

6☐ Five days

**** M6** **<u>During the weekend</u>**

1☐ I never have breakfast during the weekend

2☐ I usually have breakfast on only one day of the weekend

3☐ I usually have breakfast on both weekend days

How often do you usually have an additional meal in a day (more than a drink or a snack)? Please tick one box for <u>weekdays</u> and one box for <u>weekend</u> (off school)

**** ME1** **<u>During the week</u>**

1☐ I never have additional meal during the week

2☐ One day

3☐ Two days

4☐ Three days

5☐ Four days

6☐ Five days

**** ME2** **<u>During the weekend</u>**

1☐ I never have additional meal during the weekend

2☐ I usually have additional meal on only one day of the weekend

3☐ I usually have additional meal on both weekend days

M7 **At present, are you on a diet or doing something else to lose weight?** *Please tick one box only*

1☐ No, my weight is fine

2☐ No, but I should lose some weight

3☐ No, because I need to put on weight

4☐ Yes

M8 Do you think your body is .....? *Please tick one box only*

1☐ Much too thin

2☐ A bit too thin

3☐ A bout the right size

4☐ A bit too fat

5☐ Much too fat

****M9 How much do you weigh without cloths?.....**

****M10 How tall are you without shoes?.....**

How many times a week do you usually eat or drink...?

		1) never	2) less than once a week	3) once a week	4) 2-4 days a week	5) 5-6 days a week	6) once a day, every day	7) every day, more than once
**M11	Fruits	☐	☐	☐	☐	☐	☐	☐
**M12	Vegetables	☐	☐	☐	☐	☐	☐	☐
**M13	Sweets (candy or chocolate)	☐	☐	☐	☐	☐	☐	☐
**M14	Coke or other soft drinks that contain sugar	☐	☐	☐	☐	☐	☐	☐
**ME3	Milk	☐	☐	☐	☐	☐	☐	☐
**ME4	Meat or chicken	☐	☐	☐	☐	☐	☐	☐
**ME5	Drink water	☐	☐	☐	☐	☐	☐	☐

Which of the following things did you do to control your weight for at least seven days during the last 12 months? (if you did nothing tick 'no' for all of the following)

		Yes	No
**ED1	Exercise	☐	☐
**ED2	Eat less	☐	☐
**ED3	Eat less sweets	☐	☐
**ED4	Eat less fat	☐	☐
**ED5	Eat more fruits and/or vegetables	☐	☐
**ED6	Drink less soft drinks	☐	☐
**ED7	Drink more water	☐	☐
**ED8	Restrict my diet to one or more food groups (eat only fruits and vegetables, drink only, eat only bread and water,....)	☐	☐
**ED9	Diet under supervision or a professional	☐	☐
**ED10	Skip meals	☐	☐
**ED11	Fasting (not on religious purposes)	☐	☐
**ED12	Vomiting	☐	☐
**ED13	Use diet pills or laxatives	☐	☐
**ED14	Smoke	☐	☐
**ED15	Other, namely		

If you sometimes miss or skip a meal, why is that? (You may indicate all the options that apply)

		Yes	No
**ME6	I never skip a meal	☐	☐
**ME7	Not hungry or have no appetite	☐	☐
**ME8	Too busy with other activities	☐	☐
**ME9	Want to lose weight	☐	☐

**ME10	Do not like what is prepared	☐	☐
**ME11	Lunch/ money forgotten	☐	☐
**ME12	Could not afford meal	☐	☐
**ME13	Other reason, namely.....	☐	☐

**** ED16 Do you think you are .....?**

1☐ Very good looking

2☐ Quite good looking

3☐ A bout average

4☐ Not very good looking

5☐ Not at all good looking

****M15 How often do you brush your teeth?** ***Please tick one box only***

1☐ More than once a day

2☐ Once a day

3☐ At least once a week but not daily

4☐ Less than once a week

5☐ Never

Physical activity

The next questions are about physical activity

Physical activity is any activity that increases your heart rate and makes you get out of breath some of the time. Physical activity can be done in sports, playing with friends, or walking to school. Some examples of physical activity are running, brisk walking, rollerblading, biking, dancing, skateboarding, swimming, soccer, basketball, football, and surfing.
For these next two questions, add up all the time you spend in physical activity each day but DO NOT include physical education or gym classes.

First, think about the different things that you did each day in the last week.

M16 Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? *Please tick one box only*

☐ 0 day ☐ 1 day ☐ 2 days ☐ 3 days ☐ 4 days ☐ 5 days ☐ 6 days ☐ 7 days

Now think about the different things that you do in a usual week.

M17 Over a typical or usual week, on how many days are you physically active for a total of at least 60 minutes per day? *Please tick one box only*

☐ 0 day ☐ 1 day ☐ 2 days ☐ 3 days ☐ 4 days ☐ 5 days ☐ 6 days ☐ 7 days

About how many hours a day do you usually watch television (including videos) in your free time? *Please tick one box for weekdays and one box for weekend*

M18	Weekdays	M19	Weekend
1☐	None at all	1☐	None at all
2☐	About half an hour a day	2☐	About half an hour a day
3☐	About 1 hour a day	3☐	About 1 hour a day
4☐	About 2 hours a day	4☐	About 2 hours a day
5☐	About 3 hours a day	5☐	About 3 hours a day

6☐ About 4 hours a day

7☐ About 5 hours a day

8☐ About 6 hours a day

9☐ About 7 or more hours a day

6☐ About 4 hours a day

7☐ About 5 hours a day

8☐ About 6 hours a day

9☐ About 7 or more hours a day

About how many hours a day do you usually spend doing school homework out of school hours? *Please tick one box for <u>weekdays</u> and one box for <u>weekend</u>*

M20 Weekdays

1☐ None at all

2☐ About half an hour a day

3☐ About 1 hour a day

4☐ About 2 hours a day

5☐ About 3 hours a day

6☐ About 4 hours a day

7☐ About 5 hours a day

8☐ About 6 hours a day

9☐ About 7 or more hours a day

M21 Weekend

1☐ None at all

2☐ About half an hour a day

3☐ About 1 hour a day

4☐ About 2 hours a day

5☐ About 3 hours a day

6☐ About 4 hours a day

7☐ About 5 hours a day

8☐ About 6 hours a day

9☐ About 7 or more hours a day

M22 How many computers do your family own? *Please tick one box only*

1☐ None

2☐ One

3☐ Two

4☐ More than two

ME14 Do you access to the internet at home?

1☐ No, I do not have a computer at home

2☐ No, I do not have access to the internet at home

3☐ Yes

About how many hours a day do you usually use a computer for each of the following? *Please tick one box for each line*

		1) None at all	2) Less than 1 hour	3) 1-2 hours	4) 2-3 hours	5) 4 hours or more
**ME15	School work	☐	☐	☐	☐	☐
**ME16	Programming	☐	☐	☐	☐	☐
**ME17	Computer game	☐	☐	☐	☐	☐
**ME18	Chats and e-mails	☐	☐	☐	☐	☐
**ME19	Surfing and downloads	☐	☐	☐	☐	☐

Tobacco use

M23 Have you ever smoked tobacco? ***(At least one cigarette, cigar or pipe)***

1☐ Yes

2☐ No

M24 How often do you smoke tobacco at present? *Please tick one box only*

1☐ Every day

2☐ At least once a week, but not every day

3☐ Less than once a week

4☐ I do not smoke

M25 At what age did you first smoked a cigarette (more than a puff)?

☐ Never I was ☐ years old (Write how old you were in the box)

****RB1 How many cigarettes do you usually smoke in a week?** ***If you smoke less than weekly or if you do not smoke, please write 0***

…… ……..Cigarettes a week

****RB2 Are you allowed to smoke at home?**

1☐ Yes, always

2☐ Yes, sometimes

3☐ No, never

Do any of the following people smoke? ***Tick one box for each person***

		1) Smokes daily	2) Smokes sometimes	3) Does not smoke	4) Do not know	5) Do not have or see this person
RB3	1. Mother	☐	☐	☐	☐	☐
RB4	1. Father	☐	☐	☐	☐	☐

I4 Have you ever smoked nargilah?

1☐ Yes

2☐ No

I5 How often do you smoke nargilah at present?

1☐ Every day

2☐ At least once a week, but not every day

3☐ Less than once a week

4☐ I do not smoke nargilah

****A1 Do you personally own a nargilah?**

1☐ Yes

2☐ No

****A2 What do your parents think about nargilah smoking**

1☐ I do not know

2☐ Approve of smoking

3☐ Indifferent to smoking

4☐ Object smoking

Violence and Injuries

Injuries Many young people get hurt or injured from activities such as playing sports or fighting with others at different places such as the street or home. Injuries can include being poisoned or burned. Injuries do not include illnesses such as Measles or Flu. The following questions are about injuries you may have had during the past 12 months.

M26 During the past 12 months, how many times were you injured and had to be treated by a doctor or nurse? *Please click one box only*

1☐ I was not injured in the past 12 months

2☐ 1 time

3☐ 2 times

4☐ 3 times

5☐ 4 times or more

If you had more than one injury, think only about the one most serious injury that you had during the past 12 months. The next questions are about your one most serious injury (the injury that took the most time to get better). If you were not injured, answer a) I was not injured for each question.

****ME20 Were you treated for this one most serious injury by cast, stitches, operation or overnight hospitalization?**

1☐ Yes

2☐ No

****VIP1 Where were you when this one most serious injury happened?** ***(Circle** the one best answer to describe your most serious injury)*

1☐ I was not injured in the past 12 months

2☐ At home/ in yard (yours or someone else's)

3☐ School, including school grounds

4☐ At a sports facility or field (not at school)

5☐ In the street/road/parking lot

6☐ At a commercial/business area (such as a restaurant, shopping mall, cinema, etc.)

7☐ Countryside (such as a lake, beach, forest, park etc.)

8☐ Other locations: write it here _____

****VIP2 What were you doing when this one most serious injury happened?**
Circle the one best answer to describe your most serious injury

1☐ I was not injured in the past 12 months

2☐ Biking/cycling

3☐ Playing or training for sports/recreational activity

4☐ Riding a skate scooter

5☐ Skating (including roller blades, skateboards, ice skating)

6☐ Walking/running (not for a sport team or exercise)

7☐ Riding/driving in a car or other motor vehicle

8☐ Fighting

9☐ Paid or unpaid work

10☐ Other: write it here _____

****VIP3 Did this most serious injury happen while participating in an organised (supervised) activity, league, or club?** *(Circle only one)*

1☐ I was not injured in the past 12 months

2☐ Yes, organized activity

3☐ No, organized activity

****VIP4 Did this one most serious injury cause you to miss at least one full day from school or other usual activities, such as sports or lessons?**

1☐ I was not injured in the past 12 months

2☐ Yes, lost at least one day of activity

How many full days did you miss?_____ **(VIP5)** ***(Please write the number of full days you missed from school or other usual activities as a result of this one most serious injury.)***

3☐ No, did not lose a day of activity

What were the main results (damage to the body) of this <u>one most serious injury</u>?
(Check all that apply)

		Yes	No
****VIP6**	I was not injured in the past 12 months	☐	☐
****VIP7**	Bone was broken, dislocated or out of joint (includes broken/chipped teeth)	☐	☐
****VIP8**	Sprain, strain, or pulled muscle	☐	☐
****VIP9**	Cuts, punctures, or stab wounds	☐	☐
****VIP10**	Concussion or other head or neck injury, knocked out, whiplash	☐	☐
****VIP11**	Bruises, black and blue marks, or internal bleeding	☐	☐
****VIP12**	Internal injury requiring an operation	☐	☐
****VIP13**	Burns	☐	☐
****VIP14**	Poisoning	☐	☐
****VIP15**	Other: write it here	☐	☐

VIP16 In what year and month did this one most serious injury happen? *(Check both the year and the month*

1☐ I was not injured in the past 12 months

2☐ 2003

3☐ 2004

VIP17 Now check the month

1☐ January

2☐ February

3☐ March

4☐ April

5☐ May

6☐ June

1☐ July

2☐ August

3☐ September

4☐ October

5☐ November

6☐ December

****A3 How often do you buckle up your seat belt when you ride in the front seat of a car?**

1☐ Always

2☐ Frequently

3☐ Sometimes

4☐ Seldom or never

5☐ There are no seat belts in the car I usually ride in

6☐ I never travel by car

****A4 How often do you buckle up your seat belt when you ride in the back seat of a car?**

1☐ Always

2☐ Frequently

3☐ Sometimes

4☐ Seldom or never

5☐ There are no seat belts in the back seat of the car I usually ride in

6☐ I never travel by car

****A5 How often do you wear a helmet when you ride a bicycle?**

1☐ I did not ride a bicycle during the past 12 months

2☐ Always

3☐ Frequently

4☐ Sometimes

5☐ Seldom or never

M27 During the past 12 months, how many times were you in physical fight?

1☐ I have not been in a physical fight

2☐ 1 time

3☐ 2 times

4☐ 3 times

5☐ 4 times or more

VIP18 During the past 30 days, on how many days did you carry a weapon, such as a knife, club or other object?

1☐ I did not carry a weapon during the past 30 days

2☐ 1 day

3☐ 2 to 3 days

4☐ 4 to 5 days

5☐ 6 or more days

Here are some questions about bullying. We say a student is **BEING BULLED** when another student, or a group of students, say or do nasty and unpleasant things to him or her. It is also bullying when a student is teased repeatedly in a way he or she does not like or when they are deliberately left out of things. But it is **NOT BULLYING** when two students of about the same strength or power argue or fight. It is <u>not</u> bullying when the teasing is done in a friendly and playful way.

M28 How often have you been bullied at school in the past couple of months? ***Please tick one box only***

1☐ I have not been bullied at school the past couple of months

2☐ It has only happened once or twice

3☐ 2 or 3 times a month

4☐ About once a week

5☐ Several times a week

M29 How often have you taken part in bullying another student (s) at school in the past couple of months? *Please tick one box only*

1☐ I have not bullied another student (s) at school in the past couple of months

2☐ It has only happened once or twice

3☐ 2 or 3 times a month

4☐ About once a week

5☐ Several times a week

Have you ever been taught about the following subjects in the school? ***Please tick one box for each line***

		1) Yes	2) No	3) Not sure
**ME21	Smoking, drugs or alcohol	☐	☐	☐
**ME22	Violence	☐	☐	☐
**ME23	Eating and dieting	☐	☐	☐
**ME24	Sex education	☐	☐	☐

****ME25** **If you will need advice or counselling on this matter, will you whom to turn to?**

1☐ Yes

2☐ No

Family Culture

Now we would like to ask you about who you live with

Please tick all the people who live here		**1) Yes**	**2) No**
ME26	Mother	☐	☐
ME27	Father	☐	☐
ME28	Other adult	☐	☐
ME29	I live in a foster home or children's home	☐	☐

ME30 How many **brothers and sisters** live with you at home?_____

1☐ Only me

2☐ 1

3☐ 2

4☐ 3

5☐ 4

6☐ 5 or more

How easy it for you to talk to the following persons about things that really bother you? *Please tick one box for each line*

		1) Very easy	2) Easy	3) difficult	4) Very difficult	5) Do not have or see this person
M30	Father	☐	☐	☐	☐	☐
M31	Mother	☐	☐	☐	☐	☐

Peer Culture

ME31 A present, hoe many close friends do you have? *Please tick one box each column*

1☐ None

2☐ One

3☐ Two

4☐ Three or more

M32 How many evenings per week do you usually spend out with your friends?
Please tick one box only

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

0 evening 1 2 3 4 5 6 7 evenings

Mental and Physical Health

In the last 6 months: how often have you had the following...? *Please tick one box for each time*

		1) About every day	2) More than once a week	3) About every week	4) About every month	5) Rarely or never
M33	Headache	☐	☐	☐	☐	☐
M34	Stomach-ache	☐	☐	☐	☐	☐
M35	Back ache	☐	☐	☐	☐	☐
M36	Feeling low	☐	☐	☐	☐	☐
M37	Irritability or bad temper	☐	☐	☐	☐	☐
M38	Feeling nervous	☐	☐	☐	☐	☐
M39	Difficulties in getting to sleep	☐	☐	☐	☐	☐
M40	Feeling dizzy	☐	☐	☐	☐	☐

Illness and Medication

****ME32 During the past 12 months how many times were you sick (ill) and had to take medication?**

1☐ I was not sick or took medication during the past 12 months

2☐ Once a year only

3☐ Twice a year

4☐ 3-4 times a year

5☐ 5-6 times a year

6☐ More than 7 times a year

****ME33 During the past 12 months how many times have you gone to your doctor or any clinic because you felt sick (ill)?**

1☐ I have not gone to my doctor in the past 12 months

2☐ Once a year only

3☐ Twice a year

4☐ 3-4 times a year

5☐ 5-6 times a year

6☐ I go to the doctor more than 6 times a year, and periodically

Do you suffer from any of the following? *(Check all that apply)*	1)Yes	2) No
**ME34 Asthma	☐	☐
**ME35 Diabetes	☐	☐
**ME36 Physical disabilities such as sever ear/eye impairment	☐	☐

M41 Would you say your health is……? *Please tick one box only*

1☐ Excellent

2☐ Good

3☐ Fair

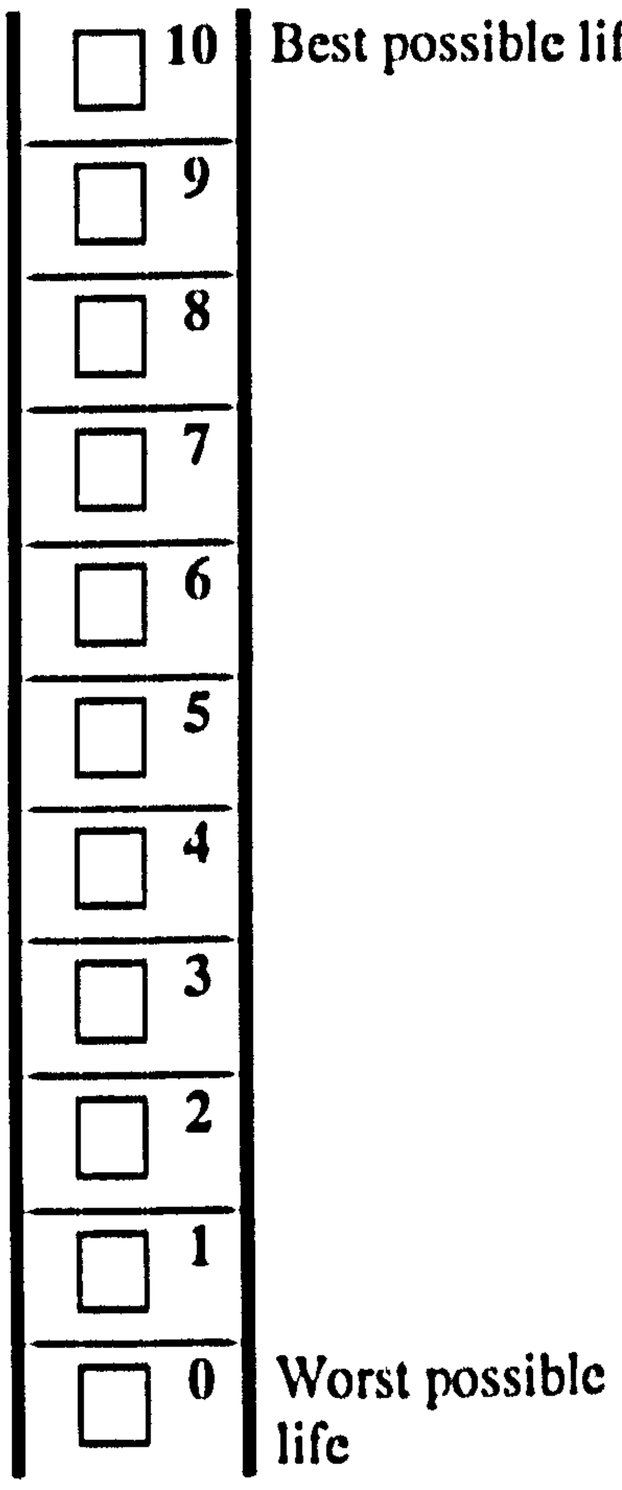
4☐ Poor

For each of the statements below, please tick the box that best describes how often you have felt like this in the past few weeks

		1) Never	2) Sometimes	3) Often	4) Almost always
PH1	I like the way things are going for me	☐	☐	☐	☐
PH2	My life is going well	☐	☐	☐	☐
PH3	I would like to change many things in my life	☐	☐	☐	☐
PH4	I wish I had a different kind of life	☐	☐	☐	☐
PH5	I have a good life	☐	☐	☐	☐
PH6	I feel good about what is happening to me	☐	☐	☐	☐

M42 Here is a picture of a ladder. The top of the ladder '10' is the best possible life for you and the bottom '0' is the worst possible life for you. In general, where on the ladder do you feel you stand at the moment?

Tick the box next to the number that best describes where you stand.



B1 Do you feel lonely?

1☐ Yes, very often

2☐ Yes, often

3☐ Yes, sometimes

4☐ no

ME37 How often does it happen that other students do not want to spend time with you at school and you end up being alone? *Please tick one box only*

1☐ It has not happened this term

2☐ Once or twice

3☐ Sometimes

4☐ About once a week

5☐ Several times a week

School Setting

M43 <u>In your opinion</u>, what does your class teacher (s) think about your school performance compared to your classmates? *Please tick one box only*

1☐ One of the best students

2☐ Good students

3☐ Average students

4☐ Below average student

5☐ One of the worst students

ME38 What kind of grades did you make on your most recent report card? *Please tick one box only*

1☐ Mostly A's and B's

2☐ Mostly B's and C's

3☐ Mostly C's

4☐ Mostly C's and D's

5☐ Mostly D's and F's

ME39 In how many subjects did you fail on your most recent report card? *Please tick one box only*

1☐ I did not fail

2☐ In one subject

3☐ In two subjects

4☐ In three subjects

5☐ In four subjects or more

M44 How do you feel about school at present?

1☐ I like it a lot

2☐ I like it a bit

3☐ I do not like it very much

4☐ I do not like it at all

B2 On how many days during this school year did you skipped classes or school?

1☐ None

2☐ One day

3☐ Two days

4☐ Three days

5☐ Four days or more

B3 During the last month, on how many days did you miss school, not due to a holiday or illness?

☐☐ days

0☐ It did not happen in the last month

Here are some statements about your school. Please show how much you agree or disagree with each one

		1) Strongly agree	2) Agree	3) Neither agree nor disagree	4) Disagree	5) Strongly disagree
S1	Our school is a nice place to be	☐	☐	☐	☐	☐
S2	I feel I belong at this school	☐	☐	☐	☐	☐

Social Inequality

M45 Does your father have a job?

1☐ Yes

2☐ No, but he is looking for a job

3☐ No, he takes care of others

4☐ Do not know

5☐ Do not have or do not see father

M46 Does your mother have a job?

1☐ Yes

2☐ No

3☐ No, she takes care of others

4☐ Do not know

5☐ Do not have or do not see mother

I6 What is your mother's education?

1☐ She did not graduated high school

2☐ She graduated high school

3☐ She continued studies after high school but not in the university

4☐ She studies in the university or graduated the university

I7 What is your father's education?

1☐ He did not graduated high school

☐

2 He graduated high school

3☐ He continued studies after high school but not in the university

4☐ He studies in the university or graduated the university

M47 How well off do you think your family is? Please tick one box only

1☐ Very well off

2☐ Quit well off

3☐ Average

4☐ Not very well off

5☐ Not at all well off

M48 Some children go to school or to bed hungry because there is not enough food at home. How often does this happen to you? *Please tick one box only*

1☐ Always

2☐ Often

3☐ Sometimes

4☐ Never

M49 Does your family own a car, van or truck? *Please tick one box only*

1☐ No

2☐ Yes, one

3☐ Yes, two or more

ME40 Some children do not have their own bed. Do you have your own bed? *Please tick one box only*

1☐ No

2☐ Yes

ME41 Do you have a comfortable space at home to do your homework? *Please tick one box only*

1☐ No

2☐ Yes

M50 Do you have your own bedroom for yourself? *Please tick one box only*

1☐ No

2☐ Yes

M51 During the past 12 months, how many times did you travel away on holiday (vacation) with your family for more than one day? *Please tick one box only*

1☐ Not at all

2☐ Once

3☐ Twice

4☐ More than twice

S3 How many days each week are you involved in any kind of club or organization (e.g. youth club, swimming/athletics club, choir, dance group etc.)

1☐ Every day of the week

2☐ 5 or 6 days a week

3☐ 3 or 4 days a week

4☐ Once or twice a week

5☐ Less than once a week

6☐ Not at all

ME42 Are you currently serving as a member of an elected committee such as pupil's council, classroom representative etc.?

1☐ No

☐

2 Yes, specify:_____

ME43 Are you currently involved in volunteering activity in your community <u>as part of your school commitment</u>?

1☐ No

2☐ Yes

ME44 Are you currently involved in volunteering activity in your community, <u>that is not initiated by your school</u> such as the Red Cross, Fire fighters etc.?

1☐ No

2☐ Yes

ME45 In what kind of volunteering activity in your community are you mainly involved?

1☐ I am currently not volunteering

2☐ Counsellor in a youth movements, political movements, religious congregation, school council, etc.

3☐ Organizations such as the Red Cross, civil defence etc.

4☐ Populations at need such as elderly people, immigrants etc.

5☐ Environment or animal care

6☐ Other, specify_____

ME46 During an average month on how many days are you involved in volunteering activity in your community?

1☐ Almost every day

2☐ Several times a week but not every day

3☐ About once a week

4☐ Once or twice a month

5☐ Less than once a month or never

ME47 On the days that you are involved in volunteering activity in your community how many hours do you usually spend doing so?

1☐ None

2☐ Less than one hour

3☐ 1-2 hours

4☐ 3-4 hours

5☐ 5-6 hours

6☐ 7 hours or more

ME48 How often do you feel bothered by violence or crime in the area where you live?

1☐ Always

2☐ Most of the time

3☐ Sometimes

4☐ Rarely or never

ME49 How often do you feel bothered by terror/military activities in the area where you live?

1☐ Always

2☐ Most of the time

3☐ Sometimes

4☐ Rarely or never

S4 Do you think that the area in which you live is a good place to live in?

1☐ Yes, it is really good

2☐ Yes, it is good

3☐ It is ok

☐

4 It is not very good

5☐ No, it is not good at all

S5 How well off is the area in which you live?

1☐ Not at all well off

2☐ Not so well off

3☐ Average

4☐ Quite well off

5☐ Very well off

10th and 12th grade students only

Sometimes people feel depressed and hopeless about the future to a point that they may think of trying to commit suicide meaning to take some action that may cause the end of their lives

I8 During the past 12 months, have you seriously considered committing suicide?

1☐ Yes

2☐ No

I9 During the past 12 months, did you make plans on how you would commit suicide?

1☐ Yes

2☐ No

I10 During the past 12 months, how many times did you actually try to commit suicide?

1☐ Never

2☐ Once

3☐ 2 or 3 times

4☐ 4 or 5 times

5☐ 6 times or more

I11 If you tried to commit suicide, did any of your suicidal attempts end up in an injury, poisoning or overdose that required a treatment by a doctor, a nurse or a medic?

1☐ I did not try to commit suicide

2☐ Yes

3☐ No

APPENDIX 2 Publications

Source: Shaheen A, Marshall T, Fletcher A, Edwards P. The determinants of unintentional injuries among Palestinian school-aged children. Abstract presented at the 9th World Conference on Injury Prevention and Safety Promotion, Merida-Mexico (15-18 March 2008)

292. THE DETERMINANTS OF UNINTENTIONAL INJURIES AMONG PALESTINIAN SCHOOL-AGED CHILDREN

**Shaheen A, 1 Marshall T, 1 Fletcher A, 1 Edwards P, 1 . (1) London School of Hygiene and Tropical Medicine, United Kingdom

Objective. In the Middle East countries, routine data from official and non official resources are used to estimate the magnitude of injury mortality (1). However, due to absence of an adequate system of accident registration in almost all of these countries, routine morbidity data are insufficient and unreliable to assess the extent of injury morbidity problem. In this study, Palestinian data collected during the Health Behaviour among School-aged Children Survey were used to indicate the determinants of unintentional injuries among school aged-children. **Material and methods.** Students selected to be surveyed were chosen using a stratified, two-stage cluster sampling. A total number of 17,715 students at the 6th, 8th, 10th and 12th grades was drawn from a representative sample of 405 schools. Using a self completed questionnaire administered in schools between April to June 2004, the prevalence of serious injury was obtained using STATA survey commands. Whether, socio-economic status, health compliments, family size and risk taking behaviour are determinants of the occurrence of serious injury, will be investigated using the logistic regressions survey command. **Results.** In comparison to children of low family affluence, the odds ratio (OR) of serious injury among children of middle family affluence was 0.80 [P=0.002, 95% CI: 0.69 to 0.92]. For other risk factors the ORs were: paternal employment 0.84 [P=0.02, 95% CI: 0.72 to 0.97], in comparison to paternal unemployment, response of "always goes to bed hungry" in comparison to those who did not was 0.73 [P=0.02, 95% CI: 0.57 to 0.95]. **Discussion and conclusions.** There is evidence that, the occurrence of serious injury is predominant among children at relatively low socio-economic status. To derive an applicable intervention policy, further work need to be done at the other potential risk factors.

Source: Shaheen A, Marshall T, Fletcher A, Edwards P. The epidemiology of unintentional injuries among Palestinian school-aged children. Abstract presented at the 9th World Conference on Injury Prevention and Safety Promotion. Merida-Mexico (15-18 March 2008)

291. THE EPIDEMIOLOGY OF UNINTENTIONAL INJURIES AMONG PALESTINIAN SCHOOL-AGED CHILDREN

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Objective: In the Middle East countries, routine data from official and non official resources are used to estimate the magnitude of injury mortality (1). However, due to absence of an adequate system of accident registration in almost all of these countries, routine morbidity data are insufficient and unreliable to assess the extent of injury morbidity problem. In this study, Palestinian data collected during the Health Behaviour among School-aged Children Survey were used to measure the prevalence, age and sex distribution of self reported experience of unintentional injuries in the proceeding 12 months period among children. **Material and methods:** Students selected to be surveyed were chosen using a stratified, two-stage cluster sampling. A total number of 17,715 students at the 6th, 8th, 10th and 12th grades was drawn from a representative sample of 405 schools using a self completed questionnaire administered in schools between April to June 2004. **Results:** 26.4% of school children reported a medically attended injury, with injury prevalence significantly higher in boys than in girls, in children at the 6th grade than in children at the 8th and 10th grades. The prevalence of serious injury caused by organised activity among boys was triple than that among girls. Home was the exceptional place of injury where girls reported more injury than boys. **Discussion and conclusions:** This study presents an epidemiological overview of the basic distributions of unintentional injuries experienced by school-aged children in the Palestinian Territory. Data presented provide a national baseline to implement intervention policies. Hence, more extensive analysis focused on the associations and interactions of specific risk factors such as psychosocial determinants of unintentional injury and socio-economic factors are planned to be done.

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 الفلسطينيِّين إلا أنه لا يولى أدنى اهتمام بمشكلة الإصابات التي يتعرَّض لها الطفل. وقد أجرى القائمان 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 ومقاطعتَيْ 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 الفلسطينيِّين كان الصواريخ الحربية (9.6)، مقارنة بحوادث الطرق بالنسبة لأطفال كلٍّ من إسرائيل (5.0) ومقاطعتَيْ 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 purposed. 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 England 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.[a]	Rate[b] (95% CI)	No.[a]	Rate[b] (95% CI)	No.[a]	Rate[b] (95% CI)
Sex						
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)
Age (years)						
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)
Total	1060	18.1[c] (17.0–19.2)	715	10.0[c] (9.3–10.7)	2052	5.2[c] (5.0–5.5)

[a]Number of children who died from injury.
[b]Per 100 000 children per year.
[c]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[a] (95% CI)	No.	Rate[a] (95% CI)	No.	Rate[a] (95% CI)	No.	Rate[a] (95% CI)	No.	Rate[a] (95% CI)
Palestinian territory										
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)
Israel										
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)
England & Wales										
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)[b]	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)[c]	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.

[a]*Per 100 000 children year per.*

[b]*Accidental suffocation and exposure to unspecified man-made environmental factors.*

[c]*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: (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[a]	95% CI	Rate[a]	95% CI	Rate[a]	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

[a]Per 100 000 children.
CI = confidence interval.

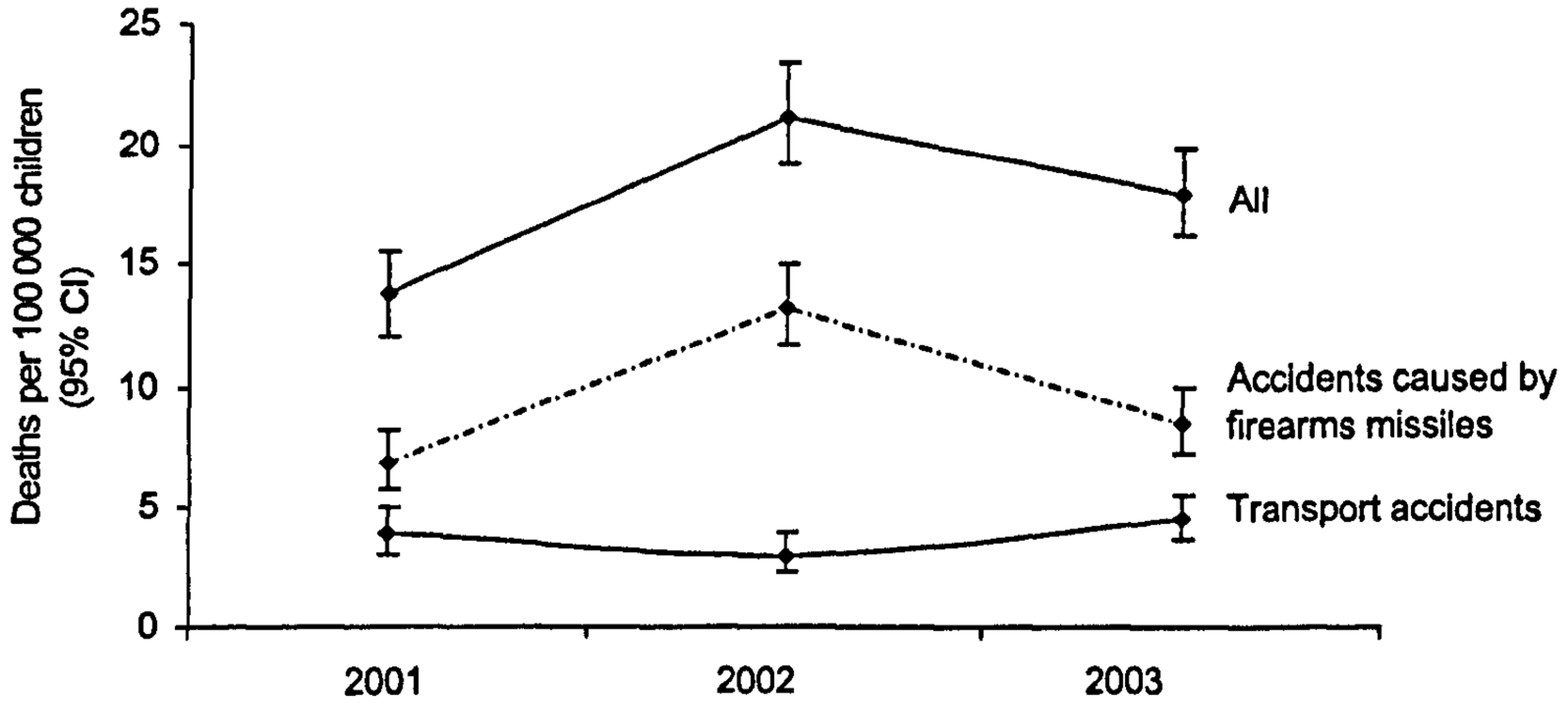

Figure 1 **Trends in injury mortality rates in children aged 0–19 years in the Palestinian Territory by firearm missiles and transport accidents for the period 2001–03**

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 informed 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.