



# **SOCIOECONOMIC DIFFERENCES IN INJURY RISKS**

**A REVIEW OF FINDINGS AND A  
DISCUSSION OF POTENTIAL  
COUNTERMEASURES**

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## ABSTRACT

Violence and injuries are not only one of the major causes of premature death but are also considered as one of the causes of mortality with the steepest social gradient. This report presents an overview of the current state of knowledge regarding socioeconomic differences in injury risks, reviewing mortality and morbidity studies conducted both inside and outside the WHO European Region, published during the past 17 years and addressing the leading causes of injury, both intentional or unintentional: interpersonal violence, self-directed violence, traffic, falls, drowning, poisoning and burns. Around 300 scientific articles have been selected and reviewed with the aim of highlighting the main features of the knowledge at hand, including where it comes from, how much attention has been paid to various injury causes, which segments of the population have been considered, and whether European studies, when they exist, obtain results that are similar to those from other parts of the world. Studies of interventions that specifically examine outcome effects across socioeconomic groups or areas were also reviewed.

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## Abbreviations

<b>A and E</b>	Accident and Emergency (departments)
<b>FMPV</b>	Female to Male Partner Violence
<b>GNP</b>	Gross National Product
<b>IPV</b>	Intimate Partner Violence
<b>OR</b>	Odds ratio
<b>MFPV</b>	Male to Female Partner Violence
<b>RR</b>	Risk/Rate ratio
<b>RTI</b>	Road Traffic Injury
<b>SES</b>	Socioeconomic Status
<b>TBI</b>	Traumatic Brain Injury
<b>UIM</b>	Unintentional Injury Mortality

## Executive Summary

Violence and injuries are not only one of the major causes of premature death but are also considered as one of the causes of mortality with the steepest social gradient. This report presents an overview of the current state of knowledge regarding socioeconomic differences in injury risks, reviewing mortality and morbidity studies conducted both inside and outside the WHO European Region, published during the past 17 years and addressing the leading causes of injury, both intentional or unintentional: interpersonal violence, self-directed violence, traffic, falls, drowning, poisoning and burns. Around 300 scientific articles have been selected and reviewed with the aim of highlighting the main features of the knowledge at hand, including where it comes from, how much attention has been paid to various injury causes, which segments of the population have been considered, and whether European studies, when they exist, obtain results that are similar to those from other parts of the world. Studies of interventions that specifically examine outcome effects across socioeconomic groups or areas were also reviewed.

It is important to remember that comparisons between studies are difficult for structural and operational reasons. As the social stratification differs from one country to another and, with it, the distribution of material and social advantages, the size of the gap between groups is not constant over countries. Also, across studies, the manner in which socioeconomic position and material deprivation are operationalised varies considerably both in the measures used and the scales or number of categories used for similar measures.

The knowledge accumulated so far can be described along the following lines:

- The volume of articles published during the past two decades in medical and public health peer-reviewed journals on the socioeconomic patterning of injuries is impressively high.
- The studies conducted are very often descriptive. Injuries are grouped in various manners and their relative distribution across individual and area socioeconomic descriptors is highlighted.
- All injury causes, all settings, and all age groups are not covered to the same extent.
- Of about 300 studies reviewed, self-inflicted injuries are definitely the causes of mortality and morbidity most studied (41% of the studies reviewed), followed by violence- and traffic-related injuries (16% each). Little attention has been paid to fall, burn, drowning or poisoning injuries.
- Mortality studies dominate the literature reviewed for some injury causes (e.g., self-directed violence, drowning, poisoning) but not all (e.g., road traffic injuries, falls). Morbidity studies are on the increase.
- Within the WHO European Region, the injury causes most studied are self-directed violence and road traffic crashes.
- The studies, though numerous, come from a limited number of countries both outside and inside the WHO European Region. In general, there is a paucity of studies from low- and middle-income countries.
- The evidence at hand is therefore mainly representative of some types of countries (governments and economies) and does not encompass many forms of social stratification.
- Within Europe, the bulk of the evidence stems from high-income countries and, most often, countries from the North. Whether this is a reflection of those countries being more concerned with equity issues in general is uncertain.
- Among mortality studies, the empirical evidence at hand very often shows strong associations with individual- and area-based material deprivation. People from low socioeconomic status and from less affluent areas tend to die by injury to a greater extent than others. This has been observed for most causes of injury (e.g., traffic, self-directed violence, interpersonal violence, poisoning, burns) but also for several settings (e.g., home, work, transport).

- Using a variety of data sources and severity criteria, studies based on morbidity data provide results somewhat less consistent than those of mortality studies. Nonetheless, numerous studies show considerable differences between socioeconomic groups even for less lethal injuries of various kinds.
- The distribution of explanatory risk and protective factors across socioeconomic groups has been studied to a limited extent and only for some causes. The most sophisticated designs are found above all in research on self-directed violence and in some instances in traffic studies.
- The literature consequently remains silent regarding the nature of the mechanisms lying behind socioeconomic differences in injury mortality and morbidity.
- Altogether, mortality and morbidity studies suggest that the socioeconomic patterning of injuries can be multifaceted, influenced by a variety of individual and contextual mechanisms.
- Multilevel studies strongly indicate that mortality and morbidity differentials across people from different socioeconomic backgrounds are a reflection not only of individual mechanisms but also of contextual ones.
- The mechanisms likely to explain those differences may vary by cause of injury, sex and age group of the victim and the setting in which the injury occurred.
- Interventions addressing the differential impact of safety interventions on various socioeconomic groups and areas are few and limited in scope. Most of them deal with injury prevention among small children and focus on home or traffic (as pedestrian, bicyclist or car rider) safety.
- Not surprisingly, as a consequence of the above, most interventions of that kind target the adoption of safe practices and the use of safety equipments, which represent one of several possible approaches for reducing socioeconomic inequalities in injuries, i.e., reducing differential susceptibility.
- Promising interventions for prevention such as those that reduce differential exposure to hazards or those that aim to reduce differential consequences of injuries seem to have received negligible attention.
- In sum, the research at hand provides a poor evidence base as to how to avoid – or narrow down – social differences in injury risks. It is therefore unclear whether prevention works best where it may be needed most.
- European countries are no exception to the above.

It ought to be underlined that restrictions in the review process undertaken by the research team, as well as publication and other selection biases beyond the team's control, may bring an overrepresentation of studies showing socioeconomic differences – or positive effects of interventions.

The maintenance of social inequalities in health and safety is regarded as a major threat to the achievement of population health targets, including raising life expectancy and average health status. In fact, for those targets to be reached and sustained, equity-oriented policies and interventions are required alongside health-for-all ones, both within and outside the health policy domain. Violence and injury are no exceptions

The report provides a general discussion where research needs are highlighted and different strategies are proposed that can contribute to the reduction of the safety divide between people and places. Interventions targeted at low socioeconomic groups or areas – which have not been included in the review process as their evaluation is not concerned with their potential for actually reducing the safety divide – are considered in the discussion as this kind of approach may have a “levelling up” potential. They are introduced in the framework of the various mechanisms of health and safety inequity they may help tackling.

## Chapter 1: Introduction

### **An old problem in a new context**

The existence of differences in the health status of people from different socioeconomic groups is not a new phenomenon. Over the years, a great deal of scientific evidence has been produced showing that people from lower socioeconomic positions have mortality rates significantly higher than those from upper positions. The health divide has indeed survived major improvements in medical science, several stages of technological development, considerable demographic changes, and substantial efforts to set up more equitable public-health systems, governments and states.

Nonetheless, the causes contributing to health differentials have changed considerably. Nowadays, although the leading causes of death in numeric terms are cardiovascular diseases and cancer, the ranking of causes changes significantly when age-at-death is considered. Then, external causes such as unintentional injuries, interpersonal violence and self-inflicted injuries become equally – and increasingly – important (WHO 2002b). Evidence for that has been produced both outside (Fukuda et al. 2005) and inside Europe (Martikainen et al. 2003; Shkolnikov et al. 1998).

One can therefore wonder whether downward trends in rates of fatal injuries noticed in rich nations, including a number of European ones (Morrison et al. 2000a; 2000b; UNICEF 2001), benefit to the same extent members of all socio-economic groups in those nations. If safety appears to have improved in general but the safety divide remains or if it worsens (Edwards et al. 2006), what does that tell us about the policies and strategies in place, or about their transferability to other countries?

It should also be emphasized that injuries not only contribute significantly to the health divide but they have also become a leading cause of death and disability around the world (Hofman et al. 2005). In the WHO European Region only, injuries account for 9% of deaths and 14% of ill-health. The burden is substantially higher in countries from Eastern Europe (Sethi et al. 2006). International prognoses suggest that the ranking of injuries as a cause of death and disability is on the rise, particularly in the younger segments of the population and in low- and middle-income countries (WHO 2002a; 2002b; WHO 2007).

The increase is not only relative, that is, compared with other health problems, but also absolute: worldwide, an increasing number of people die of injuries or are disabled daily. Explanations for this can be found, among others, in the rapid macro-economic phenomenon of internationalization, urbanization, and motorization (Whitehead and Dahlgren 2006a; 2006b; Sethi et al. 2006) and their related consequences on people and communities, life styles and practices.

### **Why care about the socioeconomic patterning of injuries?**

Paying attention to variability in population health and safety is important for several reasons. One is that social stratification and income distribution have an impact on population health and safety. It has even been proposed that the size of the gap between the mortality and morbidity rates of the most and the least advantaged groups can be regarded as indicative of the potential for improvement in a nation's (or living area's) health and safety (Blane 1995).

Perhaps most importantly, injury differentials should not inevitably reflect differences in wealth: they are neither unavoidable nor irreversible (Laflamme 1998). For example, built-in safety measures of various types (e.g., better housing, safer products) and the conception of safe environments (traffic separation, traffic calming, and safer home or work environments) can do a lot to enhance safety for all – including the least well off.

Further, as abatement strategies (the protection of each citizen through a collective measure that affects a whole community or country) may not always be possible, making a choice between alternative countermeasures aimed at reducing the safety divide may require a deeper understanding of the mechanisms via which socioeconomic differentials in violence and injury risks are produced. For example, when environmental changes are too costly, empirical evidence may be needed to determine which of several possible measures is most likely to impact on injury risks (or their consequences), in a particular deprived living area or hazardous work environment.

A further aspect already raised above is the distribution of the benefits of prevention. Although there is growing evidence that “prevention works”, we do not really know whether it works where it is needed most (Towner et al. 2005). As in other prevention domains, it is highly probable that programmes implemented under less than ideal conditions produce fairly negative results, particularly when they rest on local participation (Strawn 1994; Beeker et al. 1998; Gottfredson et al. 1998; Stone et al. 2007). To date, strategies for prevention specifically aimed at reducing socioeconomic disparities are few and often limited in scope. This, in turn, provides us with only limited evidence-based alternatives.

Last but not least, some interventions may even miss their target and have negative effects on socioeconomic disparities. This is the case for instance with information campaigns aimed at influencing individual health and safety behaviours, as those who are most likely to “get the message” and put it into practice may belong to the already less at-risk groups.

### **Why this review?**

A great deal of research has been produced on socioeconomic disparities and injury, most of which is cause-specific (e.g., road traffic injuries of various kinds, domestic violence, self-directed violence). Reviews have been conducted, often on specific causes or particular age groups (see box below), but the information remains scattered. An overarching picture of the problem has not yet been achieved. Plans to reduce socioeconomic disparities could greatly benefit from a clear situation analysis of the problem, from which the implications for policy, practice and research can be discussed.

This report is an attempt in that direction. It presents an inclusive overview of the current state of knowledge regarding socioeconomic differences in injury risks by considering studies published in the medical and public health literature during the past 17 years that address the leading causes of both fatal and non-fatal injury: interpersonal violence, self-directed violence, traffic, falls, drowning, poisoning and burns. A distinction is introduced between studies according to whether they were conducted inside or outside the WHO European Region (including both EU and non-EU countries). Even multi-country studies are considered.

Population-based interventions that aim to reduce socioeconomic differences in injury risks were also sought. As the focus of the review was on the safety divide, it was decided that interventions targeted exclusively at deprived groups would be included only in instances where the programme effects and outcomes were assessed in comparison with better-off socioeconomic groups. Targeted interventions without that kind of assessment would be considered in the discussion chapter of the report.

The aim of this report is to highlight the main features of the knowledge at hand, to clarify where it comes from, which segments of the population it is based on and whether European studies, when they exist, reach results that are similar to those from other parts of the world. Thereafter, research needs as well as key mechanisms that can be tackled in order to combat the socioeconomic patterning of injuries are highlighted in a general discussion.

The report is tailored to public health researchers and practitioners, safety planners, and policy makers and should serve as a source of information, reflection and inspiration for research and practice.

### **Earlier reviews**

#### ***Peer-reviewed articles***

- Birken CS, Macarthur C. Socioeconomic status and injury risk in children. *Paediatr Child Health* 2004;9:323-25.
- Boxer PA, Burnett C, Swanson N. Suicide and occupation: a review of the literature. *J Occup Environm Med* 1995;37:442-52.
- Bruns J Jr, Hauser WA. The epidemiology of traumatic brain injury: a review. *Epilepsia* 2003;44 Suppl 10:2-10.
- Cubbin C, Smith, GS. Socioeconomic inequalities in injury: Critical issues in design and analysis. *Ann Rev Publ Health* 2002;23:349-375.
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- Evans GW. The environment of childhood poverty. *Am Psychol* 2004;59:77-92.
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- Reading R, Haynes R, Shenassa ED. Neighborhood influences on child injury risk. *Child Youth Environment* 2005;15:165-85.
- Rehkopf DH, Buka SL. The association between suicide and the socio-economic characteristics of geographical areas: a systematic review. *Psychol Med* 2006;36:145-57.
- Warda L, Tenenbein M, Moffatt ME. House fire injury prevention update. Part I. A review of risk factors for fatal and non-fatal house fire injury. *Inj Prev* 1999;5:145-50.
- Wilkinson RG. Health, hierarchy, and social anxiety. *Ann N Y Acad Sci* 1999;896:48-63.

#### ***Reports***

- Engström K. *Social Inequality in Violence-related Injuries: Knowledge Accumulated, Research Needs, and Alternatives for Prevention*. Sweden's National Institute of Public Health: Stockholm, 1999.
- Laflamme L. *Social Inequality in Injury Risks: Knowledge Accumulated and Plans for the Future*. Sweden's National Institute of Public Health: Stockholm, 1998.
- Towner, E, Dowswell T, Emington G, Burkes M, Towner J. *Injuries in Children aged 0-14 years and Inequalities*. United Kingdom: Health Development Agency, 2005.

#### ***Meta-analyses***

- Guterman NB. Enrollment strategies in early home visitation to prevent physical child abuse and neglect and the "universal versus targeted" debate: a meta-analysis of population-based and screen-based programs. *Child Abuse & Neglect* 1999;23:863-90.
- Kendrick D, Coupland C, Mulvaney C, Simpson J, Smith S, Sutton A, Watson M, Woods A. Home safety education and provision of safety equipment for injury prevention. *Cochrane Database Systematic Review* 2007 Jan 24; (1):CD005014.

### **How was the review conducted and how is the report structured?**

Original research articles that examined socioeconomic disparities in injury risk or measured the effects of interventions across socioeconomic groups were obtained through a literature search in the databases of SafetyLit, the Cochrane Library and the National Library of Medicine's Medline. For the former database, all studies included under "social disparities" were examined for relevance. All Cochrane reviews related to injury were considered. For the latter database, English, French, Swedish and Danish language studies published between January 1990 and June 2006 were identified using the keywords "injury or injuries or violence or accident or accidents or suicide or parasuicide or deliberate self harm" in

conjunction with “educational status or education or social class or socioeconomic status or occupation or income or social position or socioeconomic position or socioeconomic context or social context or deprivation or socio-economic factors or socio-economic characteristics or residence characteristics or neighbourhood”. Additional studies were also identified from the reference lists in selected articles and in those of the reviews listed above.

Although the limited number of databases examined may mean that the search was not exhaustive the approach used with those databases was as inclusive as possible. Any study including denominators and testing for significance or providing confidence intervals was dealt with regardless of the strength of its design and the effort made to control for confounding factors. The inclusion criteria of the papers are presented in the box below.

**Inclusion criteria for studies in the review**

- Publication: in a peer-reviewed journal between January 1990 and June 2006
- Language: English, French, Danish and Swedish studies
- Design and methods: For risk distribution studies, wide ranging but use of tests for statistical significance or included confidence intervals. For intervention studies, randomised controlled trials or controlled before and after studies
- Focus: For risk distribution studies, examination of the relationship between socioeconomic status (SES) and injury at an individual- or area-level as the primary research question. Studies merely controlling for SES were excluded. For intervention studies, those measuring the effects of interventions across socioeconomic groups
- Severity level: fatal and non-fatal injuries
- Cause: all injury types resulting from interpersonal violence, self-directed violence, traffic collisions, falls, drowning, poisoning and burns
- Analytical level: both area-based and individual-based studies
- Measures for individual-based studies: education, income and wealth, social class/occupational status, composite measures of these factors and proxy measures such as neighbourhood deprivation
- Measures for area-based studies: compositional aspects such as educational level, occupational status, income, wealth, poverty, and deprivation of an area

In the time since the literature search was completed, two important meta-analyses regarding interventions to reduce injuries in the home environment came to the authors’ attention – one on home safety education for childhood unintentional injuries of various kinds (Kendrick et al. 2007) and the other on early home visitation programmes to reduce child physical abuse and maltreatment (Guterman 1999). Given that they assess differences in outcomes depending on whether interventions are population-based or targeted – although the specific studies that they cover did not – they have been included in the review.

The selected articles were then classified according to each main injury cause. A number of studies covered several injury causes combined or focused on specific injury sites or body parts. Given the inclusive approach taken in the review process, an additional chapter was included: all/mixed causes and specific sites or body parts. This section highlights those various mortality and morbidity studies that have looked at socioeconomic disparities from another angle than “cause-specific”.

As becomes evident, some causes of injuries received considerable attention during the past decades, above all self-directed violence but also interpersonal violence and traffic. Other causes are covered to a very limited extent, e.g., falls, drowning, poisoning and burns. In light of this, the report has the following sections:



### ***Unintentional injury causes***

- Traffic
- Falls, burns, poisoning, drowning and mixed causes

### ***Intentional injury causes***

- Self-directed violence
- Interpersonal violence

### ***Other***

- All causes or injuries of specific sites or body parts

While the use of the above broad categories are in keeping with WHO practice, in individual chapters these have often been replaced with terms more commonly used in research, and therefore also the terms used in the literature search. This particularly pertains to self-directed violence which is more commonly referred to as suicide, with fatal outcome (suicide mortality); or as attempted suicide, deliberate self-harm, or parasuicide with non-fatal outcome (suicide morbidity). Although an important issue, it is beyond the scope of this report to debate the definitions of these terms.

In the report, each section is introduced with a summary of the main findings and examples from different countries showing the size of the associations between socioeconomic status and injury. This is followed by a brief overview of the studies and their findings, and study-by-study tables. The studies are grouped according to where they have been conducted (within or outside Europe) and whether they are based on individual data, area data (so called ecological studies), or both (so called multilevel studies).

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## Chapter 2: road traffic injuries

### Summary and examples of findings

The vast majority of the articles within this area focused on children and young people. Most of the studies were conducted in European countries, especially in the Northern part of Europe. Studies from outside Europe came from the USA, Canada, New Zealand and Australia. Altogether, the findings show that low socioeconomic position at the area or individual level seems to increase the risk of being injured in traffic. This applies, to a varying extent, to different ages and for different kinds of traffic categories. The results indicate that there are socioeconomic differences not only for mortality, but also for road traffic injury morbidity, as measured by both minor injuries and injuries requiring hospital in-patient care. The evidence concerning socioeconomic differences in relation to gender is conflicting.

<b>Mortality studies*</b>	<b>16</b>	
<b>Country</b>		
Europe	11	England, Spain, Sweden, The Netherlands
Outside Europe	4	Australia, Canada, New Zealand, USA
Multi-country	1	
<b>Age</b>		
All ages	2	
Childhood/youth	9	
Adulthood	5	
<b>Category of road users</b>		
All users aggregated	8	
Users separated (more than one)	5	
Users separated (only one)	3	
<b>Morbidity studies*</b>	<b>35</b>	
<b>Country</b>		
Europe	25	Greece, Ireland, Spain, Sweden, United Kingdom
Outside Europe	9	Canada, USA
Multi-country	1	
<b>Age</b>		
All ages	3	
Childhood/youth	27	
Adulthood	5	
<b>Category of road users</b>		
All users aggregated	9	
Users separated (more than one)	17	
Users separated (only one)	9	
Interventions	4	Canada, New Zealand, United Kingdom
Related risk factors	8	Belgium, Mexico, Sweden, United Kingdom, USA

\* Some studies dealt with both injury mortality and morbidity and they are reported twice.

The following table presents examples of studies where positive associations between socioeconomic status and different types of road traffic injury were found. The studies are presented by country of origin.

Severity	Country	Findings
<b>Mortality</b>		
Studies within Europe		
	Spain <sup>1</sup>	A multi-level analysis from Barcelona revealed a higher risk of traffic injury death for the population with no schooling, after adjustment of contextual variables for both males and females (RR=4.26 and 4.24 respectively).
	England and Wales <sup>2</sup>	Child injury deaths have fallen in most socioeconomic groups from 1981 to 2001 except for children in families with no adult in paid employment. Steep social gradients are still evident particularly for pedestrian injuries (RR=4.7).
Studies outside Europe		
	Canada <sup>3</sup>	An area-based study in Montreal and all of urban Canada observed that children living in the poorest neighbourhoods had a four times higher risk for RTIs compared to children in the least poor neighbourhoods.
	USA <sup>4</sup>	A study based on the nationwide personal transportation survey and the Fatality Analysis Reporting System (FARS) found higher RRs for those who had not completed high school for both men and women (3.52 and 2.79 respectively).
<b>Morbidity</b>		
Studies within Europe		
	Greece <sup>5</sup>	Children residing in less wealthy towns had almost double the risk of having pedestrian injuries compared with children living in wealthier towns.
	Sweden <sup>6</sup>	National studies based on individual data indicate that low socioeconomic position is related to a higher risk of RTIs. The injury risk of pedestrians and bicyclists are 20-30% higher among the children of manual workers than those of intermediate and high level salaried employees. Socioeconomic differences increase for injuries involving motorised vehicles (RR between 1.70-1.80).
	United Kingdom <sup>7,8</sup>	A number of studies from the UK have observed a strong relationship between deprived areas and a high rate of pedestrian injuries. A cross sectional survey in Trent showed that children in the most deprived areas had a nearly 4 times higher risk for pedestrian injuries compared to children in the most affluent areas.
Studies outside Europe		
	New Zealand <sup>9</sup>	The risk of pedestrian injuries among children in the lowest socioeconomic groups was over twice that of the children in the higher socioeconomic groups.

1 Borrell et al. 2002

2 Edwards et al. 2006

3 Dougherty et al. 1990

4 Braver et al. 2003

5 Moustaki et al. 2001

6 Hasselberg et al. 2001

7 Coupland et al. 2003

8 Hippisley-Cox et al. 2002

9 Roberts et al. 1995

### Social differences in road traffic injuries

The studies included herein are organized in three main sections representing studies conducted within Europe and outside Europe, and a section on risk factors and interventions.

**European studies.** From the total number of 44 reviewed articles, 33 were from European countries, mainly from the northern part of Europe. A large number of the studies focused on children and young people. Both area-based and individual level studies have been conducted. The effect of area deprivation on RTIs has been studied for different kinds of road users. All studies but one showed a relationship between low socioeconomic position and an increased risk of road traffic injuries. The area-based studies have primarily focused on pedestrian and bicycle injuries. A study focusing on pedestrian casualties in England found an association between increased deprivation and higher numbers of pedestrian casualties for all ages, but a stronger association for children (Graham et al. 2005). The strong relationship between the degree of deprivation and pedestrian injuries for children is also shown in other studies from Britain (Adams et al. 2005; Coupland et al. 2003; Edwards et al. 2006; Lyons et al. 2003; Kendrick 1993). Children in deprived areas in England have up to a four times higher risk for pedestrian injuries compared to children in more affluent areas. A recent English study shows that even though child injury deaths have decreased in most socioeconomic groups over the last twenty years, the clear inequalities in injury deaths

between children in different socioeconomic groups remain, particularly for pedestrians (Edwards et al. 2006). This association was also found for children in Greece where less wealthy towns had a twofold excess of pedestrian injuries compared to wealthier ones (Moustaki et al. 2001). An area-based study from Sweden focusing on children and young people showed a difference between rich and poor areas with regard to pedestrian injuries but not regarding injuries as a bicyclist (Reimers and Laflamme 2004). A study from the Netherlands showed that an important part of the influence of sociodemographic factors on bicycle injury mortality is attributed to differences in the use of bicycles (Van Beeck 1991).

In studies based on individual level data, socioeconomic position is usually measured by education, income or occupation (or by grouping occupations into social class). Parental socioeconomic position is commonly used for measuring children's socioeconomic position. Despite differences in the kind of measure used for socioeconomic position or deprivation, all studies except one showed that better-off people are at less risk for road traffic injuries. A Swedish study showed that socioeconomic position of origin (based on both the education and socioeconomic group of the parents) seems to have a long-term effect on the risk of RTI through childhood and adolescence to young adulthood. By contrast, disposable income of the household seems to be a relatively less important risk factor in late adolescence and young adulthood than during childhood (Hasselberg et al. 2004).

Two studies from Spain used multilevel analyses to study the role of individual and contextual effects on RTI. The results showed a higher risk for traffic injury (both morbidity and mortality) among populations with low education, after adjusting for the contextual variables of the neighbourhood (Borrell et al. 2002; Ferrando et al. 2005). Both studies showed a contextual neighbourhood effect after having taken into account individual factors. The study by Ferrando and colleagues (2005) found that neighbourhoods with more unemployment had a higher risk of injuries.

***Studies from outside Europe.*** Eleven studies from outside Europe were found, of which seven were based on area level data, three on individual-based measures of socioeconomic position, and one used a combination of both individual and contextual data. Three of these studies focused separately on pedestrian injuries and found a strong relationship between socioeconomic characteristics of the area and the rate of pedestrian injuries. This applied to both children and adults (Rivara et al. 1985; La Scala et al. 2000). One study from the USA used both individual level data and area-based data and found that social inequalities in motor vehicle mortality exist for both individuals and places (Cubbin et al. 2000).

***Age-specific results.*** Most of the studies within this area have focused on children and young people. Studies from Britain found the strongest association between social position and RTIs among the youngest children, 0-4 years (Hippisley-Cox et al. 2002). The studies from Sweden, on the other hand, found smaller differences for younger children and increased differences when children grow older and come into contact with motorised vehicles. Furthermore, the socioeconomic pattern for different kinds of road users in Sweden differs somewhat from other countries. By contrast with countries like the UK and Canada, where the steepest socioeconomic gradient was found for pedestrian injuries (Edwards et al. 2006; Dougherty et al. 1990; Roberts and Power 1996), Sweden showed only small socioeconomic differences with regard to injuries of this kind (Hasselberg et al. 2001). In two area-based studies from Canada and Sweden, a difference was found between rich and poor areas with regard to traffic injury as a pedestrian but not as a bicyclist (Dougherty et al. 1990; Reimers and Laflamme 2004). This was explained by reference to bicyclists moving outside their own residential area to a greater extent, and thereby being exposed to less hazardous immediate environments than their own.

***Gender-specific results.*** The evidence concerning socioeconomic differences in relation to gender is conflicting. A multi-country study showed a similar social pattern for men, but conflicting results for women. Men with lower education had an increased death rate in transportation injury in all country settings. An increased risk for RTIs was also found for women aged 30-49 years in Finland and Belgium. A reverse pattern was found in Norway, where women with high educational levels had higher injury rates (Borrell et al. 2005). An area-based study from Greece indicated that boys are disproportionately

disadvantaged regarding pedestrian injuries when they reside in less wealthy towns (Moustaki et al. 2001). By contrast, a Canadian study found larger socioeconomic differences in traffic injuries (with regard to both morbidity and mortality) for girls than for boys (Dougherty et al. 1990). Swedish studies, on the other hand, found a similar social patterning for both sexes (Laflamme and Eilert-Petersson 2001; Hasselberg et al. 2001).

### **Risk factors and interventions**

A number of studies have focused on the social distribution of factors related to road traffic injury risk, for example, to investigate if the use of safety devices varies between different socioeconomic groups. There are only a few studies, however, that have tried to estimate if different types of interventions have the same effect in all socioeconomic groups.

**Reduction of exposure.** The prevention of pedestrian injuries among children is a priority in many countries. Traffic calming has shown to be associated with absolute pedestrian injury reduction and also in relative inequalities in child pedestrian injury rate (Jones et al. 2005). Walking school buses has become a popular initiative with the aim to increase both the safety and the physical activity among children. However, a study from New Zealand shows that the uptake of walking school bus schemes is more common in affluent neighbourhoods than in deprived ones (Collins and Kearns 2005).

A Swedish study indicates that the car-safety level seems to affect the distribution of RTIs between people from different socioeconomic groups to a limited extent (Laflamme et al. 2005).

**Behaviour.** Impaired driving and other unsafe driving behaviour have also been studied in relation to socioeconomic position. A Swedish study showed that alcohol impairment was a risk factor for injured drivers in all socioeconomic groups, but the proportion of impaired drivers was higher among injured drivers from manual worker families and those with low individual educational attainment (Vaez and Laflamme 2005). A study from the USA did not find any differences in complete avoidance of drinking before driving between different educational levels or income levels (Shinar et al. 2001).

**Safety equipment.** There are some studies, mainly from outside Europe, focusing on socioeconomic factors in relation to use of safety equipment (e.g., seat belts, bicycle helmets). An observational study from the USA showed that seat belt use was higher in areas with higher median income and higher home values (Shinar 1993; Lerner et al. 2001). Similar results were found in an interview study from Belgium showing a lower seat belt use among unskilled worker households and households with lower income compared to upper white-collar households and those with higher income (Leveque et al. 2004). Another study from the USA showed that seat belt use increased with educational level for both males and females. For women the use increased with increasing income, but the reported use for males did not differ with increasing income. On the other hand, the reported rate that observed the speed limit all the time decreased with increasing education and income (Shinar et al. 2001).

A study from Mexico has investigated the use of different kinds of safety devices. A questionnaire was sent to parents regarding the use of safety devices and caution. The results from this study showed minor or inconsistent socioeconomic differences regarding caution, but large differences regarding the use of safety devices, with lower use of safety devices for lower socioeconomic groups (Mock et al. 2002).

The ownership of bicycle helmets has also shown to be lower among children in deprived areas compared to more affluent areas. This was shown in a study from the UK (Kendrick et al. 2003). A Canadian study focusing on the use of bicycle helmets showed that the absolute gain of bicycle helmets for head injuries was greater in rich municipalities, but the relative gain of helmets was just as great in poor municipalities as in rich ones (Farley et al. 2003). In line with this, another Canadian study looking at the effectiveness of bicycle helmet legislation for children concluded that helmet legislation is effective in increasing helmet use by all children and particularly those in low-income areas (Parkin et al. 2006).

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**Table 1.1 Social differences in road traffic injuries: area-based studies within Europe**

STUDY	POPULATION	GEOGRAPHICAL AREA	SEX	MEASURE	OUTCOME	RESULT
Adams et al. 2005	UK, Northumberland, Tyne, Wear, Children under 16 years	Enumeration district	Aggregated	Townsend Deprivation Score	Police reported RTIs as pedestrians or vehicle passenger	Strong socioeconomic inequalities in pedestrian RTIs in children, but decreasing differences between 1988 and 2003
Coupland et al. 2003	UK, Trent Children 0-14 years	Electoral wards	Aggregated	Townsend deprivation score	Long bone fractures as bicyclist, pedestrian or other transport injury	Clear socioeconomic gradient, but no significant change between 1992-1997
Reimers & Laflamme 2004	Sweden Stockholm county, Children 10-19 years	Parish level	Males/ females separated	Socioeconomic circumstances, populations density and migration, education, country/region of origin.	RTIs as moped rider, car passenger, bicyclist, pedestrian, other and horseback rider	Boys in areas with relatively higher concentration of socioeconomic precariousness and immigrant concentration have reduced risk for RTIs as bicyclists and moped riders
Hipsley-Cox et al. 2002	UK, Trent Children 0-4 years & 5-14 years	Electoral wards	Aggregated	Townsend Deprivation Score	Injury as cyclist, pedestrian and other transport injury	Socioeconomic gradient for RTI among children up to 15 years, especially in those under 5 years that persisted with severity level. The gradient was steepest for pedestrian injuries
Graham et al. 2005	UK Children and adults	Census ward level	Aggregated	Index of multiple deprivation (IMD)	RTIs and fatalities as pedestrians reported by the police.	An association between increased deprivation and higher number of pedestrian casualties. For all ages but stronger association for children
Engström et al. 2002	Sweden Falköping municipality All ages	All residents	Males/ females separately	Parish: % unemployed, % low educated, % born outside Sweden	In- and outpatient; traffic injuries	No remarkable and significant differences in injury risk between areas with various socioeconomic structure
Elmén & Sundh 1994	Sweden, City of Gothenburg Children and youth	3 area groups based on data on parish level	Males/ females separately	Mean income	RTI mortality	Successively increasing mortality with lower socioeconomic status for both men and women
Lyons et al. 2003	UK, Wales Children, 0-14 years	Electoral tracts deprivation – 5 quintiles	Aggregated	Townsend deprivation score	Hospital admission pedestrian injuries	Socioeconomic variation in injury rates, to the detriment of the more deprived wards
Moustaki et al. 2001	Greece, Towns of Greater Athens 0-14 years	Towns of Greater Athens	Males/ females separately	% adult household head with higher degree % of residences with less than one person per room	Pedestrian injuries attended at the emergency department	Less wealthy towns had an almost twofold excess of pedestrian injuries compared with wealthier ones. The social gradient was steeper outside the residential town
Van Beeck et al. 1991	Regions in the Netherlands All ages	Regions	Aggregated	Per capita income, degree of urbanisation	RTI mortality as Pedestrian, motor vehicle occupants, cyclists	A higher income level is associated with lower RTI mortality levels
Kendrick 1993	UK, Greater Nottingham 0-11 years	Deprivation zones based on aggregated enumeration districts	Aggregated	Deprivation scores	Pedestrian injuries Reported by the police	A significantly higher rate in deprived areas and a dose response relationship, degree of deprivation and injury rates
Bentham 1986	England and Wales except Isles of Scilly and City of London Males 15-24	County districts, metropolitan districts and boroughs	Only males	% of persons in households whose head was in social class IV or V	Death rates from motor vehicle traffic injuries	Higher mortality associated with populations with high proportions of social classes IV and V
Silversides et al. 2005	Ireland, North and West Belfast	Electoral wards	Aggregated	The Noble index, social deprivation measure	RTI morbidity, vehicle, bicycle, pedestrian, other transport	Children living within the most deprived areas were more likely to be involved in road traffic injuries (RR=1.19-2.88)

**Table 1.2 Social differences in road traffic injuries: individual-based studies data within Europe**

STUDY	POPULATION	SEX	MEASURE	OUTCOME	RESULT
Borell et al. 2005	Austria, Belgium, Denmark, Finland, Norway, Switzerland, Region of Madrid in Spain, Turin (Italy), Barcelona (Spain). Over 30 years	Males/ female separately	Educational level (low, middle & high)	Transportation injury mortality (hospital based data)	Men with lower education had an increased death rate in transportation injury in all country settings. No difference for women altogether. Low educated women aged 30-49 yrs in Finland and Belgium had higher RR. A reverse pattern in some countries, for example in Norway women with high educational levels had higher rates
Edwards et al. 2006	England and Wales 0-15 years	Aggregated	Social class of the father. National Statistics Socioeconomic Classification (NS-SEC)	RTI mortality as pedestrian, car occupant, bicyclist, other and unspecified RTIs	Child injury deaths have fallen in most socioeconomic groups from 1981 to 2001 except for children in families with no adult in paid employment. Steep social gradients are still evident for pedestrian injuries
Roberts 1997	England and Wales 0-15 years	Aggregated	Social class of the father	Mortality due to motor vehicle traffic injury, bicycle injury or pedestrian injury	The risk for pedestrian injury was 4.6 higher among children in social class V compared to children in social class 1. The gradient was least for motor vehicle occupant injuries
Roberts and Power 1996	England and Wales 0-15 years	Aggregated	Social class of the father	Mortality due to Motor vehicle injuries or pedestrian accidents	Steep social gradients for pedestrian injury for both periods (1979-83 and 1989-92). The decline in mortality due to motor vehicle injuries and pedestrian injuries was smaller in the manual working class than in the non-manual working class
Pless et al. 1989	UK Sample of children, 8-11 and 12-16 years Children born 1958	Males/ females separately	Social class based on fathers education	RTI requiring medical attention	No association between social class and RTI among the children
Hasselberg et al. 2001	Sweden 2-24 years	Males/ females separately	Household SES based on occupation	Injury as pedestrian, bicyclist, moped users, motorcyclists and car drivers (hospital based data)	Clear socioeconomic differences for all road users but increasing differences for motor vehicle users
Engström et al. 2003	Sweden Three age cohorts (5-19) over a 5 year period 1990-1994	Males/ females separately	Socioeconomic status (4 groups)	Morbidity and mortality due to traffic	Little evidence of equalisation of socioeconomic differences over the years 1990-1994
Laflamme et al. 2002	Sweden 0-4 years, 5-9 years, 10-14 years, 15-19 years	Males/ females separately	Household SES based on occupation	Injury as Pedestrian, Bicyclist, Motor-vehicle passenger, Motor-vehicle driver	Negligible socioeconomic differences in the early years (0-4 yrs) but clear differences for all other groups
Laflamme et al. 2004	Sweden 0-19 years	Males/ females separately	Household SES based on occupation	Injury morbidity Pedestrian, Bicyclist Motor-vehicle users	Equalisation for older boys as bicycle users and also short lasting for the young males
Hasselberg &	Sweden 1-14 years	Adjusted for sex	Social class Income	Injury morbidity Pedestrian	Socioeconomic position of the household, whether based on occupation, income or education, affects the risk of being injured in traffic both during

STUDY	POPULATION	SEX	MEASURE	OUTCOME	RESULT
Laflamme 2004			Education	Bicyclist Car passenger (hospital based data)	upbringing and young adulthood
Hasselberg & Laflamme 2003	Sweden 16-23 years	Males/ females separated	Social class Income Education	Injury as car drivers (hospital based data)	The long-term effects of parental social class and education on RTIs are evident in the case of young drivers. Family disposable income does not impact on the risk for older children
Hasselberg & Laflamme 2005	Sweden 16-23 years	Males/ females separated	Social class Education	Injury as car drivers (hospital based data)	Car drivers who were injured several times show a similar social distribution to that of drivers sustaining just one RTI
Hasselberg & Laflamme 2005	Sweden 18-30 years	Male/ female Separated	Social class of origin Educational attainment	Injury as car drivers (police reported data)	Children of farmers are at greater risk of overtaking and other front-on collisions, but not other kinds of crashes. Children of manual workers show an excess risk of all types of car-crashes except rear-end collisions
Laflamme et al. 2006	Sweden 18-30 years	Males/ females separately	Social class of origin Educational attainment	Injury as car drivers (police reported data)	Male drivers and those with lower educational attainment are over-represented in all types of crash-pattern
Laflamme & Eilert-Petersson 2001	Sweden Wästmanland municipality 20-64 years	Males and females separately	Socioeconomic groups (4)	Medically attended transport injuries	Men and women from lower SES showed an excess risk of injuries in the transport areas
Murray 1998	Sweden 16-22 years	Males and females separately	Social class School achievement and attainment	RTI injury	The school achievement and school attainment deviated among young people involved in injuries compared to a sample of young people not involved in RTIs
Zambon & Hasselberg 2006	Sweden 16-25 years	Males and females separately	Social class of origin (occupation)	Morbidity and mortality as motorcycle drivers (hospital based data)	Low socioeconomic position increases the injury risk of both minor and severe outcomes to an equal extent, without giving rise to a higher risk of severe outcomes
Zambon & Hasselberg 2006	Sweden 16-25 years	Aggregated	Social class of origin (occupation)	Morbidity and mortality as motorcycle driver (police-reported and hospital based data)	Socioeconomic differences in motorcycle injuries are mostly observed at the ages 17-19 years

**Table 2.1 Social differences in road traffic injuries: area-based studies outside Europe**

STUDY	POPULATION	GEOGRAPHICAL AREA	SEX	MEASURE	OUTCOME	RESULT
Turrell & Mathers 2001	Australia 0-14, 15-24 and 25-64 years	Collector's district	Males/females separately	Index of relative socioeconomic disadvantage	Mortality due to motor vehicle traffic injury	Increased mortality inequality for motor vehicle injuries for males in all age groups and for females in the age groups 15-24 and 25-64 years
Dougherty et al. 1990	Urban Canada and Montreal 0-14 years	Census tracts	Males/females separately	Median household income in census tracts	RTI mortality and morbidity	The rate of RTI was four times higher for children living in the poorest neighbourhoods compared to affluent areas. Inequalities more pronounced for pedestrians than bicyclists. Socioeconomic inequalities in fatal injuries greater in girls than in boys
Durkin et al. 1994	USA, health center districts in Northern Manhattan, Central Harlem and Washington Heights 0-17 years	Census tracts	Aggregated	% living below poverty level % with low income % with low education unemployment	Motor vehicle injury Pedestrian injury	Areas with low income, low level of education and high unemployment have higher rates of motor vehicle injuries and pedestrian injuries
Rivara et al. 1985	USA, City of Memphis, 0-14 years	Census tracts were the injury occurred	Males/females separately	Mean household income % living below the poverty level	Pedestrian injuries reported by the police	Socioeconomic characteristics of the census tracts were strongly correlated to the injury
LaScala et al. 2000	USA, the city and county of San Francisco, USA All ages	Census tracts	Aggregated	Education by census tract Median income	Pedestrian injury reported by the police	Pedestrian injury rates were related to traffic flow, population density, age composition, unemployment, gender and education
Joly et al. 1989	Canada, the island of Montreal 0-14 years	Census tracts	Aggregated	Level of income, housing value, education	Bicycle injuries requiring hospital visits	The level of education, income, and housing, was significantly lower in areas with high risk of bicycle injuries
Brownell et al. 2002	Canada, Manitoba 0-19 years	Neighbourhoods	Aggregated	Income levels	Mortality and morbidity due to motor vehicle injury	Both injury mortality and morbidity correlated significantly with income level of the neighbourhood, higher injury rates were associated with lower income levels

**Table 2.2 Social differences in road traffic injuries: Individual-based studies outside Europe**

STUDY	POPULATION	GEOGRAPHICAL AREA	SEX	MEASURE	OUTCOME	RESULT
Whitlock et al. 2003	New Zealand Sample of adults		Aggregated	Occupation Education	Motor vehicle driver injury	Driver injury risk was inversely associated with both occupational status and educational status
Braver et al. 2003	USA Adults 25-64 years		Males /females separated and combined	Education	Motor vehicle occupant fatality	For both gender combined a greater fatality ratio for those with lower education
Roberts et al. 1995	New Zealand, Auckland region 0-15 years		Aggregated	Individual socioeconomic position, New Zealand Elley Irving scale	Mortality and morbidity, pedestrian injury by motor vehicle	The risk of injury for children in the lowest socioeconomic groups was over twice that of the children in the higher socioeconomic groups. However, the odds ratios attenuated after adjustment of environmental factors as high traffic volume and high density of parked cars

**Table 2.3 Social differences in road traffic injuries: multiple studies**

STUDY	POPULATION	SEX	MEASURE		OUTCOME	RESULT
			INDIVIDUAL LEVEL	NEIGHBOURHOOD LEVEL		
Borrell et al. 2002	Spain, Barcelona > 19 years Age groups (e.g., 20-34, 35-44, 75+) 1992-1998	Females and males separately	Educational level	% men unemployed, % men in jail	Mortality due to traffic	Higher risk for people aged 20-34 years with no schooling for RTIs. Women over 75 years with no schooling had lower risk for RTIs
Ferrando et al. 2005	Spain Barcelona 19 years + (categories)	Males and females separately	Educational level	Area of residence: % unemployment	A&E department injury: motor vehicle, falls, hits and cuts	Morbidity rates traffic injuries higher for lower educational level (individual, after adjustment) and higher % unemployment (contextual)
Cubbin et al. 2000	USA Sample of 18-64 years in	Males and females separately	Income to needs ratio, educational attainment, employment status, occupation	Census tracts Economic standing, residential and family stability, racial concentration, urbanisation	Motor vehicle injury mortality	Low income, unemployed, blue collar and people without a high school degree significantly increased risk.  Neighbourhoods with lower socioeconomic status and higher proportion of poor households headed by women had higher risk. Urban areas or highly segregated neighbourhoods lower risk.

**Table 3.1 Social differences in different kinds of risk factors related to road traffic injury: studies within Europe**

STUDY	POPULATION	SEX	MEASURE	OUTCOME	RESULT
Vaez & Laflamme 2005	Sweden 18-30 years	Male/female separated	Social class of origin Education	Impaired drivers RTI morbidity and mortality (police reported data)	The proportion of impaired drivers was higher among drivers from manual worker families and those with low individual educational attainment.
Laflamme et al. 2005	Sweden 18-30 years	Male/female separated	Social class of origin Educational attainment	Car safety in RTI as Car drivers (police reported data)	Car-safety level only affects the distribution of injuries between people from different socioeconomic groups to a limited extent.
Leveque et al. 2004	Belgium (sample of people) 15-25 years	Male/female separated	Occupation, education, income	Seat belt use in a population sample	Significant differences in seat belt use were found between occupational groups and income groups. Unskilled worker households and households with lower incomes used seat belt to a lesser extent than Upper white collar households and those with higher income.
Kendrick et al. 2003	UK, 28 primary schools in Nottingham	Aggregated	Townsend deprivation score	Cycle helmet ownership and helmet wearing	Children in deprived areas were less likely to own a helmet,

**Table 3.2 Social differences in different kinds of risk factors related to road traffic injury: studies outside Europe**

STUDY	POPULATION	SEX	MEASURE	OUTCOME	RESULT
Shinar 1993	USA Sample of adults	Aggregated	% of blue collar worker Average home values	Safety belt use	Sites having high safety belt use had higher average home values.
Shinar et al. 2001	USA Sample of adult drivers	Male/female separated	Education and income based on survey data	Seat belt use, Observe speed limits Drive after drinking	Reported seat belt use increased with education. For women seat belt use increased with income, but not for men. Avoidance of drinking and driving hardly varied across education level and income groups. Observed speed limits decreased with increased education and income.
Lerner et al. 2001	USA, one region Adults	Adjusted for sex	Median household income in the sip code area	Seat belt use among injured adults admitted to trauma center for RTI	Socioeconomic status was a significant predictor of seat belt use.
Mock et al. 2002	Mexico, Monterey Sample of children 1-12 years	Aggregated	Three socioeconomic strata Clinics in different socioeconomic areas	Safe response scores by type of activity (caution and use of device)	Minor or inconsistent SES differences regarding caution, but large differences regarding use of safety devices.



**Table 4.1 Interventions with the aim to reduce social differences in the risk of road traffic injury**

<b>STUDY</b>	<b>POPULATION</b>	<b>SEX</b>	<b>MEASURE</b>	<b>OUTCOME</b>	<b>RESULT</b>
Jones et al. 2005	UK, two cities 4-16 years	Aggregated	Townsend deprivation score	Pedestrian injury rate Speed humps, road narrowings, road closures	Traffic calming is associated with absolute pedestrian injury reduction and also in relative inequalities in child pedestrian injury rate
Collins & Kearns 2005	New Zealand, Auckland 29 of 34 schools with walking school bus schemes	Aggregated	NZ deprivation index 2001, quintiles	Implementation of walking school bus	Walking school bus schemes were more common in affluent neighbourhoods than in deprived ones.
Parkin et al. 2003	Canada, Toronto Children 5-14 years Health district of Metropolitan Toronto	Aggregated	Average family income	Bicycle helmet use	Bicycle helmet use increased significant after helmet legislation, the effect was most powerful among children who resided in low-income areas.
Farley et al. 2003	Canada Montérégie region, 5-12 yrs	Aggregated	Haan's area-based measure of socioeconomic position	Hospital treated bicycle related head injuries	The absolute gain of bicycle helmets for head injuries was greater in rich municipalities, but the relative gain of helmets was just as great in poor as in rich communities.



## Chapter 3: falls, burns, poisoning, drowning or mixed

### Summary and examples of findings

This section deals with four causes of unintentional injuries: falls, burns/scalds, poisoning, drowning. They are included in one chapter on the grounds that the literature on their socioeconomic distribution is scarce and also because the studies conducted usually address them all – or some of them – at once. When these causes are considered in one single study, the study population often consists of children and adolescents and the design is area-based. These studies are considerably more frequent in Europe and most of them show that, for these causes, there are steep socioeconomic gradients for injury mortality and morbidity in childhood and youth. Multilevel studies, both within and outside of Europe, conducted on adult populations, confirm that there are independent contextual effects of deprivation, particularly for falls. As for other causes, the more severe the injury the stronger the association becomes.

Mortality and morbidity		
	28 studies	
Falls or hip fracture only		
Europe	3	Sweden, United Kingdom
Outside Europe	0	
Multi-country	0	
Burns and fire only		
Europe	2	United Kingdom
Outside Europe	6	Peru, South Africa, USA
Multi-country	0	
Intervention: single country	2	United Kingdom
Intervention: cross-country	1	A series of meta-analyses including 22 studies (several countries but mainly from the USA and the United Kingdom)
Falls/Burns/Poisoning/Drowning		
Europe	9	Ireland, United Kingdom, Spain, Sweden
Outside Europe	4	Australia, Canada, USA
Multi-country	1	

Studies focusing on the socioeconomic patterning of falls are few and show mixed results in both adult and child populations. Whereas strong neighbourhood effects on hip fracture were observed among Swedish elderly people (in Stockholm), no association or only small ones were found among the elderly from the UK. Among children, when falls are split in sub-groups, both protective and aggravating effects of the neighbourhood are observed.

Burn-specific studies, very few of which are conducted in Europe, for their part confirm the strong association between individual- or area-based material deprivation and burn injuries of various severity levels.

Meta-analyses of home safety education programmes for the prevention of childhood injuries reveal that home safety education – often combined with the distribution of safe products – is effective in influencing the uptake of a range of safe practices whereas their effect on injury occurrence is uncertain. It is not obvious that programmes targeting more deprived groups, all of which have been implemented in high income countries, are less effective than population-based ones.

Some examples of the size of the associations between socioeconomic status and injury from different

countries are shown in the table below. No such figures are available for drowning or poisoning injuries, or fall injuries resulting in death.

Severity	Country	Findings
<b>Burn mortality</b>		
<b>Studies within Europe</b>		
	England and Wales <sup>1</sup>	Rates of death from injury in children aged 0-15 years were compiled by employment status in the family (class) and compared over time for the whole of England and Wales. In spite of downward trends in overall rates, inequalities remain, among others, for death from house fires. Compared with children from families with the best occupational status, those from less favourable ones had a 37.7 times higher death rates due to exposure to smoke, fire and flames.
<b>Studies outside Europe</b>		
	USA <sup>2</sup>	A study from the State of Tennessee on the predictors of mortality from fires in children aged less than five years found that children whose mothers had less than a high school education had a 19.4 times increased risk of a fatal fire event.
<b>Burn morbidity</b>		
<b>Studies within Europe</b>		
	United Kingdom <sup>3</sup>	A study conducted in Lancashire and South Cumbria on burn and smoke inhalation in secondary care (all ages) revealed a 3% increase in injuries per thousand population for every increase of one unit in the Townsend deprivation score.
<b>Studies outside Europe</b>		
	Peru <sup>4</sup>	A study conducted in Lima observed that household lack of water supply, low income, and crowding were associated with an increased risk of hospitalisation for burn injuries among children (ORs respectively 5.2, 2.8 and 3.9).
	South Africa <sup>5</sup>	In the Cape Town region, an area-based study on paediatric burns revealed graded associations between housing conditions and hospitalisation for burns (OR 2.4 and 3.3) for poor and impoverished neighbourhoods compared to favourable ones.
<b>Fall morbidity</b>		
<b>Studies inside Europe</b>		
	United Kingdom <sup>6,7</sup>	A study on the association between material deprivation and the incidence of hip fracture among young adults and older people conducted in Wales revealed significantly higher incidences in poorer electoral wards (Townsend index) among young adults (RR=1.64) but not among the elderly. The association diminished with age, and was not observed in people aged 85 and over (RR=0.94).
		A study in Trent considered both falls and hip fractures among people aged 75+ years. A small but significant association at electoral ward level between material deprivation (Townsend score) and hospital admissions was observed for falls (but not hip fracture), with the most deprived wards having a 10% higher admission rate (adjusted) compared with the most affluent wards.

1 Edwards et al. 2006

2 Scholer 1998

3 Rajpura 2002

4 Delgado et al. 2002

5 Van Niekerk et al. 2006

6 Jones et al. 2004

7 West et al. 2004

This section covers four causes of injuries: falls, burns/scalds, poisoning, drowning. They are dealt with at once mainly because the literature on their socioeconomic distribution is scarce and also because the studies at hand usually address them all – or some of them – at once. To our knowledge, two of them only, falls and burns, have been considered separately in studies within and outside Europe. The presentation will start with those two causes, followed by the results gathered from the “mixed” studies, national and international ones.

## Falls

Studies on the socioeconomic patterning of fall-related injuries are few and are exclusively from the northern part of Europe. Two of them, from the United Kingdom, deal with hip fracture among elderly people and considered men and women together. The studies offer contrasting results. In one of them (Jones et al. 2004), considering data from accident and emergency departments, it was observed that fracture incidence was significantly higher in more deprived electoral wards among younger adults but that the effect diminished with age, and was not observed in older age groups (e.g., 85+). The second study, looking at hospital admissions for falls and hip fractures, observed a small but significant association between hospital admissions for falls and material deprivation, with the most deprived wards having a 10% higher admission rate (adjusted) compared with the most affluent wards (West et al. 2004). There was no association between hospital admission for hip fracture and deprivation.

The third study concerns fall-related injuries among children aged 0-15, split into two age groups: 0-6 and 7-15 years. The study divided the fall injuries in various sub-diagnoses and considered also various severity levels and various contextual measures (Laflamme and Reimers 2006). For children aged 0-6, deprived socioeconomic circumstances was the exposure with the strongest association with falls, most often in the sense of a protective effect (except for falls from furniture). The same applied to social integration (economic and cultural) among older children (except in the case of falls on the same level). The role played by population socioeconomic status was negligible.

**Intervention studies.** A meta-analysis review study on home safety education programmes for the prevention of childhood injuries conducted by Kendrick et al. (2007) identified 22 studies that reported a range of outcomes related to fall prevention, those studies being population-based or targeting socioeconomically vulnerable households. After methodological review, 13 studies were included in the meta-analyses. Those revealed that compared to their controls, families receiving the education programmes were

- more likely to have a fitted stair gate (regardless of whether they received a stair gate or not), an effect that was significantly stronger in families living in non-owner occupied accommodation;
- less likely to have or use a baby walker. The programmes functioned better when focused on that practice only, delivered in clinical settings, and over a longer time. They were significantly less effective amongst parents from black and ethnic minority groups;
- not more or less likely to possess window locks. Programmes tended to be less effective among single parent families.

## Burns and House Fires

As opposed to falls, studies on burns and house fires are almost exclusively from outside Europe, particularly from the USA.

**European studies.** Two studies were found that met the inclusion criteria and both were from the United Kingdom. One dealt with burns and smoke inhalation in secondary care in Lancashire and South Cumbria; it showed an increase in admissions with increasing social deprivation (Rajpura 2002). A second study focused on childhood injury mortality over time. It considered various causes and compiled rates by employment status in the family (class) for three different time periods for the whole of England and Wales. In spite of downward trends in overall rates, inequalities remained for death from house fires, among others. Compared with children from families with the best occupational status, those from less favourable ones had a 37.7 times higher death rates due to exposure to smoke, fire and flames.

**Studies from outside Europe.** Six studies from outside Europe were found, of which two were based on individual level data and focus on childhood injuries and four were on area-based data and encompassed different age groups. One individual level study is from Peru and deals with child hospitalisation for burns of various types, considering indicators such as household income and crowding

as well as maternal education (Delgado et al. 2002). It observed that low income and crowding were associated with increased risk; better maternal education had a protective effect. In the USA, house fires resulting in at least one fatality in children less than five years were assessed in relation to maternal demographic characteristics and neighbourhood income (Scholer 1998). The study found that lower education among mothers was associated with a more than threefold increase in fatal fire events. A prior association between maternal neighbourhood income and race did not persist in the multivariate analysis.

Two area-based studies were conducted in Dallas (Texas) and considered residential fire-related deaths, either in children aged 0-19 (Istre et al. 2002a) or all ages aggregated (Istre et al. 2002b). Injuries occurred predominantly in the youngest ages (<5 years) and in poor neighbourhoods (measured in terms of median income of the neighbourhood). In Philadelphia, when studying non-fatal structure fire injury (Shai 2006), it was observed that older housing (prior to 1940) and low income had significant independent effects on fire injury rates; there was also a significant interaction between older housing and low income.

Finally, in Cape Town (South Africa) an area-based study on burn injuries among children aged 0-12 years looked at the effect of housing conditions, socioeconomic barriers and child dependency on burn injury rates (Van Niekerk et al. 2006). It found that each indicator impacts significantly on the risk of burn injury, with increased levels of exposure leading to increased risk of burns. Graded relationships were also observed for housing conditions and socioeconomic barriers.

**Intervention studies.** In the United Kingdom, studies on the possession of smoke alarms have been conducted in light of social disparity, especially in areas with a high risk of residential fires and fire-related injuries. The studies conducted by DiGuseppi and colleagues (1999) in inner London showed that, on inspection and testing, few council had any installed, functioning smoke alarms, Yet, it proved to be possible to implement a large scale smoke alarm giveaway programme in that area (DiGuseppi et al. 1999).

For its part, the meta-analysis review study on home safety education programmes for the prevention of childhood injuries conducted by Kendrick et al. (2007) identified 48 studies that reported a range of practices related to thermal injury prevention, 20 of which were included in the meta-analyses. The analyses conducted revealed that, compared to their controls, families receiving the education programmes were

- more likely to have a safe hot tap water temperature (11 studies included). Some evidence was provided that programmes tended to be more effective in non-owner occupier families;
- more likely to have a functioning smoke alarm (13 studies included). The programmes functioned better when they provided smoke alarms and slightly better when delivered in clinical settings rather than in the home or community. Effect sizes were not different between socioeconomic groups (e.g., housing tenure, parental unemployment, family type, ethnic group);
- more likely to own a smoke alarm (12 studies included). Effect sizes were not different between socioeconomic groups (e.g., housing tenure, parental unemployment, family type, ethnic group);
- somewhat more likely to use fire guards (provided in all four studies included)
- not significantly more likely to keep hot drinks or food out of reach of children (4 studies included), to store matches safely (4 studies included), or to possess a fire extinguisher (4 studies). When possible to measure, effect sizes were not different between socioeconomic groups;
- not significantly more or less likely to report thermal injuries (4 studies).

### Studies in other or on mixed diagnoses

**European studies.** Most European studies where several injury causes were dealt with are area-based and focus on injuries among children and adolescents. One of them was individual-based and is a national study from Sweden including four age groups of children and adolescents (Engström et al. 2002). In this study, no significant association was found for fall injuries, whatever the age group (see also the section on “all causes”). The studies conducted at the area level fairly consistently show an association between deprivation of the living area and the causes of injury of interest herein, often with steep gradients. All of them concern children and adolescents; several are from the United Kingdom (Hippisley-Cox et al. 2002; Kendrick and March 2001; Lyons et al. 2003), two are from Sweden (Reimers and Laflamme 2004; 2005) and one is from Ireland (Silversides et al. 2005). Yet, when attention was paid to the age and sex of the child, and when smaller sub-groups of causes were considered (e.g., within falls), not only “aggravating” but also “protective” effects of deprivation are observed (Reimers and Laflamme 2005; 2004).

A study from the United Kingdom also paid attention to other age groups (Lyons et al. 2003) and observed that the socioeconomic gradients were not as high among older people as they were among those aged 0-14 or 15-75 years.

There are also two multilevel studies from Spain that concern adult people. One is on mortality (Borrell et al. 2002) and the other on accident and emergency data (Ferrando et al. 2005). Education is the one variable used at the individual level and percentage of unemployed is used at the area level (even percentage of men in jail in one study). The mortality study (Borrell et al. 2002) found that, for several diagnoses including falls and “drug overdose”, educational level followed a gradient with higher risks for no schooling (after adjustment) and some socioeconomic inequalities were more important in the young (20-34 years). The contextual effect of deprivation remained after adjustment. The study based on accident and emergency data showed that, after adjustment, for all three causes studied (motor vehicle, falls, hits/cuts) rates were higher for lower educational level (individual, after adjustment) and higher percentage of unemployment (contextual), indicating that both individual and contextual mechanisms came into play.

**Studies from outside Europe.** There are three studies from outside Europe, two of which are based on individual data and from the USA, while one is area-based and from Canada. The latter study concerns children and adolescents and the former, adults.

The two studies from the USA are large scale. The first one considered injury death and injury morbidity together and split by cause (of which falls is one), both sexes aggregated and for different measures of SES (Cubbin et al. 2000). It appeared that SES was an important injury determinant and that its effect depended on the indicator chosen, on injury cause and on injury severity. The other study considered mortality for different causes of injury among people aged 20-64 years from 27 states (Steenland et al. 2003). Men’s SES was strongly associated with mortality from all causes combined, which was less obvious for women. The pattern was similar when specific causes were analysed (motor vehicle, suicide, homicide, medical complications). Even the area-based study from Canada (Faelker et al. 2000) is very supportive of the association between material deprivation and injuries, both within age and sex strata (including falls).

**Multi-country studies.** Two studies compared countries for their GNP per capita and grouped them in different ways in order to investigate the association between GNP and unintentional injury mortality, all ages aggregated (Ahmed and Andersson 2000) or among the young ( 1-14 years) (Plitponkarnpim et al. 1999). The former study showed that unintentional injury mortality was inversely correlated with GNP per capita and the relationship became stronger with increasing age. The latter study, based on almost the same material, showed that the second most common cause of unintentional injury mortality was poisoning (after road traffic injuries) in all country groups except low-income countries where drowning dominated for males and mixed causes for females. Drowning for males and burns for females in the low and middle-income countries were significantly higher than in high-income countries.

***Intervention studies on poisoning.*** The meta-analysis review study on home safety education programmes for the prevention of childhood injuries conducted by Kendrick et al. (2007) identified 40 studies that reported a range of practices related to poisoning prevention, 18 of which were included in the meta-analyses. The analyses conducted revealed that, compared to their controls, families receiving the education programmes were

- more likely to store medicine safely (8 studies);
- more likely to store cleaning products safely (11 studies included). The programmes functioned better when they provided locks together with education rather than education only and when delivered in the community rather than in a clinical setting;
- more likely to possess syrup of ipecac (10 studies included). The programmes functioned better when they provided syrup ipecac together with education rather than education only and when delivered in the community rather than in a clinical setting;
- more likely to have the poison control centre number accessible (7 studies). Families with at least one parent not in paid employment were significantly more likely to have the number accessible than those with employed parents;
- not significantly more or less likely to report poisoning (3 studies);

In general, there was no evidence that the interventions varied in effect with family type (single parent home vs. other).

***Intervention studies on drowning.*** The meta-analysis review study on home safety education programmes for the prevention of childhood injuries conducted by Kendrick et al. (2007) identified six studies that reported a range of practices related to drowning prevention, three of which were included in the meta-analyses. The analyses conducted revealed that, compared to their controls, families receiving the education programmes were

- not more or less likely to leave children alone in the bath (3 studies). The interventions were more effective in single parent as compared to two parent families but did not differ in effect regarding housing tenure or ethnic group;
- not significantly more or less likely to report medically attended or self-reported injuries (8 studies).



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**Table 5. Falls and hip fractures: area-based studies within Europe**

Author(s)	Setting/period	Age group	Sex	Measure	Outcome	Results
Jones et al. 2004	United Kingdom Wales	Adult and elderly (age groups)	Aggregated	Electoral tract: Townsend deprivation scores by quintiles	Fracture reported by A&E departments	Fracture incidence significantly higher in wards more deprived among younger adults. The effect diminishes with age, and is not observed in older age groups (e.g., 85+)
West et al. 2004	United Kingdom Trent 1992-1997	75+ years	Aggregated	Electoral ward: Townsend deprivation scores by quintile	Hospital admission for hip fracture and fall	Small but significant association between hospital admissions for falls and the Townsend score, with the most deprived wards having a 10% higher admission rate (adjusted) compared with the most affluent wards. No association between hospital admission for hip fracture and deprivation
Laflamme & Reimers 2006	Sweden Stockholm County 1999-2001	0-15 years split into 2 age groups 0-6/7-15	Boys and girls separately	Parish level, 3 indices: deprivation, SES and social integration	Fall injuries leading to hospitalisation split into 7 sub-diagnoses; 3 severity levels	For children 0-6, deprived socioeconomic circumstances have the strongest association with fall, most often in a "protective" manner (except for falls from furniture). The same applied to social integration (economic and cultural) among older children (except in the case of falls on the same level). The role played by population SES was negligible

**Table 6.1 Burns and House Fires: individual-based studies within Europe**

AUTHOR(S)	SETTING/PERIOD	AGE GROUP	SEX	MEASURE	OUTCOME	RESULTS
Rajpura 2002	United Kingdom Lancashire and South Cumbria 1997-1999	All ages in categories	Males and females	Ward level Townsend deprivation scores	Burn and smoke inhalation in secondary care	Increase in admissions with increasing social deprivation
Edwards et al. 2006	England and Wales 1981, 1991, 2001	Children aged 0-15	Males and females	Family employment status	Exposure to smoke, fire, and flames	Children from family with the least favourable occupational status had a 37.7 times higher death rates than those from the most favourable one.

**Table 6.2 Burns and House Fires: individual-and area-based studies outside Europe**

AUTHOR(S)	SETTING/PERIOD	AGE GROUP	SEX	MEASURE	OUTCOME	RESULTS
<b>INDIVIDUAL LEVEL</b>						
Delgado et al. 2002	Peru Lima 1998/12-2000/01	0-17 years	Separated and aggregated	Household income and crowding, maternal education	Hospitalisation for burns of all types	Low income and crowding are associated with increased risk; better maternal education has a protective effect
Scholer 1998	USA State of Tennessee 1980-1995	< 5 years		Maternal demographic characteristics and neighbourhood income	House fire resulting in at least one fatality	Mother education was associated with a more than threefold increase in fatal fire events. The association between maternal neighbourhood income and race did not persist in the multivariate analysis
<b>AREA LEVEL</b>						
Istre et al. 2002	USA Dallas city 1991-1998	0-19 years in categories	Aggregated	Census tract median income	Residential fire related deaths	Injuries occurred predominantly in the youngest ages (<5 years) and in poor neighbourhoods.
Istre et al. 2002	USA Dallas city 1991-1997	All ages in categories	Aggregated	Census tract median income	Residential fire related deaths	Injuries occurred predominantly among the elderly and in poor neighbourhoods
Shai 2006	USA Philadelphia 1993-2001	All ages	Aggregated	Census tract	Nonfatal structural fire injury	Older housing (prior to 1940), low income have significant independent effects on fire injury rates; there is a significant interaction between older housing and low income
Van Niekerk et al. 2006	South Africa Cape Town 1999-2000	0-12 years	Aggregated	Residential area	3 indices: housing conditions, socioeconomic barriers, child dependency	Each index has a sig. impact on the risk of burn injury, with increased levels of exposure leading to increased risk of burns. Graded relationships are observed for housing conditions and socio-economic barriers.

**Tabel 7.1 Several causes: individual- and area-based studies within Europe**

AUTHOR(S)	SETTING/PERIOD	AGE GROUP	SEX	MEASURE	OUTCOME	RESULTS
<b>INDIVIDUAL LEVEL</b>						
Engström et al. 2002	Sweden Whole country 1990-1994	0-19 years 0-4, 5-9, 10-14, 15-19	Aggregated	Socioeconomic status (4 groups)	Hospitalisation and fatality; Fall, traffic, violence and self-inflicted injuries	No difference for falls; highest relative differences in the 14-19 yrs, to the detriment of lower SES for both categories of intentional injuries; differences also high for traffic for the 15-19 yrs
<b>AREA LEVEL</b>						
Reimers & Laflamme 2005	Sweden Stockholm County 1999-2001	0-15 years	Aggregated	Parish level, 3 indices: deprivation, SES and social integration	Injuries leading to hospitalisation split into 12 injury causes	Deprivation negatively influenced pedestrian injuries, had a protective effect on other traffic injuries; Higher concentration of people with low SES increased the risk of burn and poisoning but did not impact on the risk of fall
Reimers & Laflamme 2004	Sweden Stockholm Metropolitan 2000-2002	10-19 years	Boys and girls separately	Parish level, 3 indices (material deprivation, SES and multi-ethnicity)	Injuries leading to hospitalisation split into 5 causes for boys and 3 for girls	Indexes had both aggravating and protective, depending on child sex and injury cause
Silversides et al. 2005	Ireland Belfast North and West 2001	0-12 years	Aggregated	Area deprivation most vs. least deprived areas	Emergency department attendance – all injuries and by cause	Significant correlation between deprivation and injury rate; ones living in the most deprived area most likely to be involved in road traffic injuries; or to suffer burn/scalds and high falls
Hippisley-Cox et al. 2002	United Kingdom Trent 1992-1997	0-14 years split into 0-4 / 5-14	Aggregated	Deprivation of the electoral ward (Townsend index) Adjusted for various parameters	Hospital admissions – different severity levels (e.g., long bone fracture and operation) and mechanisms (6)	Admission for injury and for injuries of high severity increase with socioeconomic deprivation; gradients are more marked for the 0-4 yr than 5-14 yr. Mechanisms with steepest gradients: pedestrian injuries, burns and scalds, and poisoning
Kendrick & Marsh 2001	United Kingdom Nottingham 1995	3 months – 3 years	Aggregated	Electoral ward deprivation, car access,	Various severity: medically attended unintentional injuries; hospital admissions	Residence in a deprived ward, no car access were associated with at least one medically attended injury; residence in a deprived ward and young maternal age, with hospital admission
Lyons et al. 2003	United Kingdom Wales 1997-1999	0-14, 15-75, 75+ years	Aggregated	Electoral tract: deprivation quintiles	Hospital admission, split into causes (e.g., falls, pedestrian injuries, poisoning and burns)	For all admissions, and admission related to self-harm, assaults, falls, pedestrian injuries, poisoning and burns, there are socioeconomic gradients with higher rates in the more deprived communities for all younger age groups. For older people only pedestrian injuries and assault related injuries show a substantial gradient

**Table 7.2 Several causes: multiple studies within Europe**

AUTHOR(S)	SETTING/PERIOD	AGE GROUP	SEX	MEASURE	OUTCOME	RESULTS
Borrell et al. 2002	Spain Barcelona 1992-1998	> 19 years Age groups (e.g., 20-34, 35-44, 75+)	Females and males Separated	Individual: education Neighbourhood: % men unemployed, % men in jail	Mortality; All and by cause: Traffic, fall, drug overdose, suicide, others	Educational level follows a gradient with higher risks for no schooling (after adjustment); some inequalities more important in the young (20-34 y); contextual effect of deprivation (after adjustment)
Ferrando et al. 2005	Spain Barcelona 1990-1991	19 years + (categories)	Separated	Individual: educational level Area of residence: % unemployment	A&E department injury: motor vehicle, falls, hits and cuts	Morbidity rates for all 3 causes higher for lower educational level (individual, after adjustment) and higher % unemployment (contextual)

**Table 8 Several causes: individual- and area-based studies outside Europe**

AUTHOR(S)	SETTING/PERIOD	AGE GROUP	SEX	MEASURE	OUTCOME	RESULTS
INDIVIDUAL LEVEL						
Cubbin et al. 2000	USA Whole country 1987-1994	18-64 years	Aggregated	Individual SES (e.g., occupation, education)	Injury deaths and injury morbidity - total and by cause	SES is an important injury determinant; the effects depend on indicator of SES, injury cause and injury severity
Steenland et al. 2003	USA 27 states 1984-1997	20-64 years (employed)	Separated	Occupation / SES	Mortality for external causes (e.g., motor vehicle, suicide, homicide)	SES strongly associated with mortality from all causes combined for men, to a lesser extent for women; similar pattern for each of the specific cause
AREA LEVEL						
Faelker et al. 2000	Canada Ontario (province) 1996	0-19 years in categories	Boys and girls separately	% people living below poverty line at census tract level	Emergency services divided in types e.g., (home, recreational, fall injuries) and severity level (minor and moderately severe)	Consistent relation between poverty and injury; both within age and sex strata and for minor and moderate injuries
Lam 2005	Australia New South Wales 1996-2000	5-19 years	Aggregated and separated	Residential location: socioeconomic level	Hospitalisation for sports related injury	No association found between SES and hospitalisation

**Table 9 Multi-country studies**

AUTHOR(S)	SETTING/PERIOD	AGE GROUP	SEX	MEASURE	OUTCOME	RESULTS
<b>COUNTRY LEVEL</b>						
Ahmed & Andersson 2000	54 countries	All ages (categories)	Aggregated	GNP per capita (for socioeconomic development); 4 country groups: low, low-middle, upper-middle and high income	Unintentional injury mortality	The second most common cause was poisoning (after traffic) in all country groups except low-income countries where drowning dominated for males and mixed causes for females. Drowning for males and burns for females in the low- and middle-income countries were significantly higher than in high-income countries





## Chapter 4 Self-directed violence

### Summary and examples of findings

The majority of studies (70%) focus on suicide mortality, and these typically include adult populations. In contrast, children and youth tend to be the focus in suicide morbidity studies. There are almost equal numbers of individual level and ecological studies and a similar number come from within Europe as from outside. The former are biased to the northern part of Europe, with some exceptions. European studies tend to focus more on suicide mortality than on morbidity. Viewed as a whole, the studies suggest that increasing disadvantage, at both the individual and area levels, is typically associated with increased suicide mortality and morbidity. However, both the direction and the strength of the association vary considerably across demographic groups, the SES measures used, the time period studied, and for ecological studies, the level of aggregation. Males and younger age groups tend to be more negatively affected by socioeconomic disadvantage. When taken into account, social fragmentation and psychiatric illness tend to affect the relationship between SES and suicide. There are no interventions evaluated from the point of view of the social patterning of their outcome in this group of studies.

Mortality studies		
Total number of studies	<b>83</b>	
Europe	37	Denmark, Lithuania, Norway, Slovenia, Sweden, United Kingdom
Outside Europe	43	Australia, Canada, China, Japan, Korea, New Zealand, South Africa, USA
Multi-country	3	Austria, Belgium, Denmark, France, Finland, Italy, Norway, Spain, Switzerland, United Kingdom
All ages	26	
Childhood/youth	8	
Adulthood	46	
Elderly	3	
Interventions	0	
Morbidity studies		
Total number of studies	<b>35</b>	
Europe	17	Denmark, Finland, Hungary, Norway, Slovenia, Sweden, The Netherlands, Turkey, United Kingdom
Outside Europe	18	Australia, Bahrain, Canada, Ethiopia, New Zealand, Uganda, USA
Multi-country	0	
All ages	1	
Childhood/youth	21	
Adulthood	13	
Elderly	0	
Interventions	0	

Some examples of the size of the associations between socioeconomic status and injury from different countries are shown in the table below. The studies are presented by severity (mortality and morbidity) and country of origin.

Severity	Country	Findings
<b>Mortality</b>		
<b>Studies within Europe</b>		
	Denmark <sup>1-5</sup>	Conflicting results emerged from several studies, with no association found between socioeconomic status and suicide after adjustment for other factors, a reduced risk of between 0.35-0.93, or an increased risk of between 1.14-3.26 with lower socioeconomic levels, depending on the measure used, its level, and the sex and psychiatric history of the victims.
	Lithuania <sup>6</sup>	A study found that compared to employees, workers had 3.68 times the risk of suicide, although education level had no effect.
	Sweden <sup>7-10</sup>	A number of studies found that people in rented accommodation as compared to that which is owner-occupied had a 1.34-2.09 times higher risk of suicide, although not for all age groups. Despite some inconsistencies, lower socioeconomic status (lack of car access, lower education, unskilled workers, overcrowding) was generally associated with a 1.15-4.0 times higher risk of suicide.
	United Kingdom <sup>11, 12</sup>	One study showed that lower deprivation was associated with lower risks of suicide for males (adjusted RRs between 0.66 and 0.96) and females (adjusted RRs between 0.50 and 0.90)
		After adjustment for several other variables, including social fragmentation, another study found that risk of suicide decreased with increased deprivation for males aged 15-44 years (RR=0.88) and females aged 45-64 (RR=0.85); but the risk increased with low social class for males aged 15-44 (RR=1.12).
<b>Studies outside Europe</b>		
	Australia <sup>13-15</sup>	In a number of studies increased disadvantage is associated with a 1.12-1.66 higher risk of suicide. Fewer associations were seen for females and in one instance, increased disadvantage was associated with a decreased suicide (RR=0.80-0.88).
	Canada <sup>16</sup>	Compared to people with moderate/high income, those with low income had a 3.2 times higher risk of suicide.
	Korea <sup>17</sup>	A study found that those in lower social classes were 1.26-1.82 (males) and 1.35-2.11 (females) times more likely to commit suicide as those in the highest social class.
	New Zealand <sup>18-21</sup>	Several studies showed that lower socioeconomic status (education, income, no car access) was associated with 1.33 to 7.0 times the risk of suicide.
	South Africa <sup>22</sup>	A city-level study found that, except for blacks, lower levels of socioeconomic circumstances were associated with a decreased risk of suicide (ORs between 0.23-0.57, depending on demographic group).
	United States <sup>23-25</sup>	Different studies have found evidence of an increased risk of suicide with both higher (ORs 1.43-1.92) and lower (RR=1.33-2.28) socioeconomic status.

Severity	Country	Findings
<b>Mortality</b>		
Studies within Europe		
<b>Morbidity</b>		
Studies within Europe		
	Denmark <sup>26</sup>	Adolescents with no vocational training and not graduated from high school showed 1.5 and 1.8 times the risk of suicide attempts, respectively, compared to those with such education.
	Hungary <sup>27</sup>	A study among repeat suicide attempters found males and females with low education had more than twice the risk of those with high education. The adjusted OR was highest for males at 3.37.
	Norway <sup>28</sup>	Hospitalized youth with parents in a low social class showed a 2.4 increased risk (adjusted for age and sex) compared to those with higher classes.
	Sweden <sup>29-33</sup>	Several studies showed that compared to children of parents with high socio-economic status, those of parents with lower status levels had between 1.13 to 3.30 times higher risk of attempted suicide. Boys and girls from households who had received welfare benefits had approximately three times the risk of those with parents who have not received such benefits.
	Turkey <sup>34</sup>	Lower parental education was associated with a 6-7% higher risk in adolescents.
Studies outside Europe		
	Australia <sup>35,36</sup>	Compared to those living in areas of low socio-economic disadvantage, males and females in areas with high disadvantage had 2.71 and 1.92 times the adjusted risk, respectively. Similarly, at an individual level, low status (except by educational level) was associated with a 2.88-3.4 higher risk for males and 1.82-4.0 higher risk for females, after adjustment.
	Canada <sup>37</sup>	A study on adolescents showed that those with a mother (but not a father) with less than high school education had 2.48 the risk of suicide attempts compared to those who had a mother with high school level education.
	New Zealand <sup>38-41</sup>	In several studies among youth (under 25 years), those with lower socio-economic status had up to a 7.7 higher risk compared to those with a high status level.
	United States <sup>42,43</sup>	Some studies have shown an increased risk among those with low socio-economic status of up to 8.43 for males and 3.46 for females.

1 Mortensen et al. 2000

2 Agerbo et al. 2001

3 Agerbo et al. 2002

4 Qin et al. 2000

5 Qin et al. 2003

6 Tamosiunas et al. 2005

7 Johansson & Sundquist 1997

8 Johansson et al. 1997a

9 Johansson et al. 1997b

10 Rubenowitz et al. 2001

11 Rezaeian et al. 2005

12 Middleton et al. 2004

13 Taylor et al. 1998

14 Taylor et al. 2005

15 Page et al. 2002

16 Holley et al. 1998

17 Kim et al. 2006

18 Beautrais 2001

19 Beautrais 2003

20 Blakely et al. 2002

21 Blakely et al. 2003

22 Burrows & Laflamme 2005

23 Kung et al. 1998

24 Iribarren et al. 2000

25 Steenland et al. 2003

26 Christoffersen et al. 2003

27 Osváth et al. 2003

28 Grøholt et al. 2000

29 Engström & Laflamme 2002

30 Engström et al. 2002

31 Engström et al. 2003

32 Engström et al. 2004

33 Mittendorfer-Rutz et al. 2004

34 Toros et al. 2004

35 Taylor et al. 2004

36 Taylor et al. 2005

37 Langille et al. 2003

38 Beautrais et al. 1996

39 Beautrais et al. 1998

40 Beautrais et al. 2003

41 Beautrais 2001

42 Iribarren et al. 2000

43 Zhang et al. 2005

For ease of reading the chapter, and in line with research in area, more common terms such as “suicide” or “suicide attempts” will be used (as opposed to self-directed violence), with a distinction made between self-inflicted injuries that result in death (suicide mortality) and those that do not (suicide morbidity). While the importance of debate and need for clarification around these definitional issues is acknowledged, it is beyond the scope of this chapter to discuss them further. The studies included herein are divided according to the level of analysis used (individual level, area-based, multilevel and country level) and according to severity of the injury (suicide mortality and suicide morbidity).

### **Individual level socioeconomic disparities and suicide mortality**

**European studies.** European individual level studies on suicide mortality came predominantly from Scandinavia (Sweden and Denmark), with a few from the United Kingdom and one from Lithuania. A wide range of SES and socioeconomic circumstances measures were used, including education, income, wealth, occupation, housing tenure, car access and overcrowding, and studies typically used a combination of them. Very few studies presented gender-specific results. Most included wide age ranges, of which only one focused on the elderly (Rubenowitz et al. 2001), and four limited their focus to young ages (26 years or younger) (Agerbo et al. 2002; Hjern and Bremberg 2002; Mittendorfer-Rutz et al. 2004; Roberts et al. 1998).

The outcomes tended to depend on the measures used and are further complicated by the addition of co-morbidity data. In Sweden, suicide risk increased with no car access (Johansson et al. 1997a) and rented accommodation (Johansson et al. 1997a; Johansson and Sundquist 1997); while in England and Wales (Lewis and Sloggett 1998), only no car access remained a significant predictor after adjustment for other SES and family variables. No effect of education or occupation on suicide was found in either of these locations (Johansson et al. 1997a; Lewis and Sloggett 1998). Similarly, no association between suicide and education, income or wealth was reported in a Danish study when controlling for other family and socioeconomic variables and a history of mental illness (Mortensen et al 2000). Using the same design, a later study (Agerbo et al. 2001) found that people with a history of mental illness and a high income were at greater risk of committing suicide than their lower income counterparts, while there was no association for those who had never been admitted to hospital for mental illness.

**Gender- and age-specific results.** The evidence at hand suggests that there are both similarities and differences in the impact of SES on male and female suicides. Using three longitudinal Danish registers, Qin and others (2000) found no association between suicide and education, income or wealth status for males or females (all ages), when adjusted for age and other SES, psychiatric and social variables. However, in another study in Denmark (Qin et al. 2003), covering a longer time period, there were considerable variations in the direction of the association between suicide and SES variables across quartiles, that also varied by gender.

Using housing tenure and overcrowding as proxy measures of social status in Sweden, Johansson and colleagues (1997b) found that renting a flat, as opposed to owning one, was a significant risk factor for suicide in both males and females, but only in the middle age group (30-49 years). For the most part, overcrowding increased the suicide risk; but among females aged 20-29 years it reduced the risk. In a different study (Johansson et al. 1997a), there was an interaction effect between gender and form of tenure, with females in rented flats and males with any form of tenure showing a greater risk of suicide. Overcrowding was a significant risk factor for suicide among males aged 30-49, and among males and females aged above 50 years.

Several studies focused on specific populations. In southern Sweden, education and occupational status did not remain in the final multivariate model as risk factors for elderly male or female suicides (Rubenowitz et al. 2001). Two studies including only males of working ages both found increased risk of suicide with decreased occupational status (Drever et al. 1996; Tamosiunas et al. 2005). The Lithuanian

study (Tamosiunas et al. 2005) additionally examined the impact of educational level on suicide and found no association.

The studies that focused on youth used parental (or in one instance sibling), rather than own, SES as their measures. Among Danish children and youth, an increased suicide risk with decreased sibling education remained after adjustment for the intermediate level only (Agerbo et al. 2002). Low parental SES was not associated with suicide in their children in England and Wales (Roberts et al. 1998), Sweden (Mittendorfer-Rutz et al. 2004) or Denmark (Agerbo et al. 2002) after adjustment for various demographic and family-related factors. One exception was a Swedish study that showed high parental SES increased the risk of suicide in children and youth (Hjern and Bremberg 2002).

***Studies from outside Europe.*** Outside of Europe, the bulk of individual level studies on suicide mortality came from North America (almost exclusively the USA). Other studies came from New Zealand, China, Korea and Australia. Most presented gender-specific results, and covered wide age ranges with all except two focusing on adult populations.

The studies not presenting demographic-specific results had varying results. There was no association between SES and suicide in Hong Kong (Yan 2000), China (Zhang et al. 2004) or the USA, except for increased suicide for labourers compared to farmers, farm workers and farm managers (reference group) (Kposowa 1999). However, an inverse relationship with suicide was found in New Zealand (Beautrais 2001) and in southern Alberta, Canada (Holley et al. 1998). The latter study used area income as a proxy for individual SES, and found that the probability of suicide at 1, 5 and 10 years was higher for those in poorer areas compared to richer areas.

***Gender- and age-specific results.*** A study in Korea and one in the USA found similar results for males and females. In Korea, a case-control study found the risk of suicide was higher in the lower social classes (Kim et al. 2006); while in a USA sample of 18-64 year-olds, there was no association between education, income or occupational status for either gender after adjustment for demographic, marital status and other SES variables (Cubbin et al. 2000a).

However, the majority of studies reported different effects of SES on the suicide risk for males and females that also vary by age group, SES measure and country. In adult populations in the USA (Iribarren et al. 2000; Kung et al. 2003) and New Zealand (Blakely et al. 2002, 2003) SES played a greater role in female compared to male suicide rates. For females, the suicide risk increased with higher educational levels in the USA studies and with decreased car access in New Zealand. Yet, the picture was reversed in other studies, in the USA (Steenland et al. 2003), in Hong Kong (Kwan et al. 2005) and among 18-24 year olds in New Zealand (Blakely et al. 2003). In these studies, male suicide risk decreased with higher socioeconomic status. Similarly, in an analysis based only on males of working ages (25-64 years) in New South Wales, Australia, manual workers had higher SMRs than professional, clerical and service workers (Burnley 1995).

Conflicting results also came from two studies focused specifically on young age groups. In a study from the USA (Hussey 1997), those under 17 years at baseline were followed-up for a nine-year period. There was no association between suicide and income or education, before or after adjustment for other SES, demographic and family variables. In contrast, a study from Canterbury, New Zealand, found that low education, but not low occupational SES, increased the risk of suicide among those aged under 25 years, after adjustment for other factors (Beautrais 2003).

One USA study explored differences between African-American and Caucasian suicides (Kung et al. 1998). Higher education and lower occupational status increased the risk for Caucasians with no effect for African-Americans.

### Individual level socioeconomic disparities and suicide morbidity

**European studies.** Few studies in Europe examined the association between individual-level SES and attempted suicide. Most come from Scandinavia, the remaining were conducted in The Netherlands, Turkey, Hungary and Slovenia. Medically treated cases (from hospitals or clinics), school students and community adolescents served as the study populations. Most studies did not present gender-specific results. With two exceptions, all focused on specific and narrow age groups that fall within the 10 to 27 year range. Given the young age groups studied, parental SES was typically used as a measure, for one or both parents. Scandinavian studies tended to use social class as a measure and studies from elsewhere used education.

Low parental SES increased the risk of suicide attempts among Turkish (Toros et al. 2004), Norwegian (Grøholt et al. 2000) and Swedish (Mittendorfer-Rutz et al. 2004) youth, but not their Dutch, Slovenian (Tomori et al. 2001) or Danish (Christoffersen et al. 2003) counterparts. Although their parents' SES status had no association with their risk of suicide attempt, Danish adolescents and young adults who were without graduation and vocational training themselves showed increased risks (Christoffersen et al. 2003). In a series of studies examining 10-19 year olds in Sweden (Engström et al. 2002; 2003; 2004; Engström and Laflamme 2002), there was evidence of increased risk for self-inflicted injuries with lower parental SES, but this was not consistent across all social class levels and was more evident among girls. Furthermore, there was a tendency towards equalisation of these socioeconomic differences in self-inflicted injuries across time only for girls in both age groups (10-14, 15-19 years) (Engström et al. 2003). In one study significant risks remained only for the older age group (10-19 years) after adjustment (Engström et al. 2002), while in another, effects were stronger in the younger ages for both males and females (Engström and Laflamme 2002).

In an adult population from Leiden, The Netherlands, Arensman and colleagues (1995) found that compared with the general population, those with low levels of education were significantly over-represented among those who attempted suicide; with no significant differences between men and women. The other study including older individuals, from Hungary, reported a gradient of increasing risk of repetition with decreasing education for the total and male group (Osváth et al. 2003). For females, only the lowest education level was associated with increased risk.

**Studies from outside Europe.** The majority of studies came from the USA and New Zealand. Others come from Canada, Australia, Bahrain, Uganda and Ethiopia. Youth (under 25 years) was the target population for many of these studies and very few present gender-specific results. Most studies included hospitalised cases, but school and general population surveys were also used.

Results for those studies without demographic-specific outcomes were mixed. Using survey data from five USA communities (New Haven, Baltimore, St Louis, Durham, Los Angeles), the inverse relation between education and suicide attempt disappeared after adjustment (Petronis et al. 1990). In contrast, there was a gradient of increasing non-fatal suicidal behaviour with decreasing SES in a 13-year follow-up of the Baltimore survey sample (Kuo et al. 2001). In Kampala, Uganda, more cases had attained a higher level of education and were represented in upper socioeconomic classes than controls (Kinyanda et al. 2004).

**Gender- and age-specific results.** The evidence at hand showed varying results across studies for adolescent and youth suicides. Using baseline data from adolescent and parental surveys, Goodman (1999) found that parental income, but not parental education and occupation, remained an independent correlate of suicide attempts after adjustment. Also, no significant associations were found between attempts and parental educational level among high school students in Addis Ababa, Ethiopia (Kebede and Ketsela 1993). Other studies have found some associations between parental education and suicide attempts but these were not consistent for all groups. For example, the main wage earner's education predicted attempts in Native Hawaiian high school adolescents but not non-Hawaiians (Yuen et al. 2000). Langille et al. (2003) found evidence of increased attempted suicide risk among high school students in

northern Nova Scotia, Canada, with low maternal (but not paternal) education after adjustment. Similarly, among overdose suicide attempters in Bahraini youth, cases were more likely than controls to have a mother with high education, but there was no difference between cases and controls for father's education or social class (Al Ansari et al. 2001).

In a series of case-control studies among youth (under 25 years) from the Canterbury Suicide Project in New Zealand (Beautrais et al. 1996; 1998; Beautrais 2001; 2003), increased disadvantage was associated with elevated rates of medically serious suicide attempts, and this was most consistent for education. Two exceptions were that income (Beautrais et al. 1998) and occupational socioeconomic class (Beautrais et al. 2003) were no longer risk factors after adjustment for social, demographic and/or psychiatric factors.

Studies including older populations also showed varying results. In California, males and females with lower education had an increased risk of hospitalization for suicide attempt (Iribarren et al. 2000). On the other hand, in another USA study, low income, but not low education, was associated with attempted suicide in men; while low educational attainment, but not income, was associated with suicide for women, after adjustment for other SES, social support indicators and health risk factors (Zhang et al. 2005). In an Australian adult population (Taylor et al. 2004), the inverse association between SES and suicide attempts for both males and females was attenuated but remained significant after adjustment for other factors, with no association with education before or after adjustment.

#### **Area-based socioeconomic disparities and suicide mortality**

**European studies.** Area-based European studies came almost exclusively from the United Kingdom and Scandinavia. All UK studies used existing indexes of deprivation, or a component of them; and the Carstairs Deprivation Index was the most widely used. Two studies additionally used the Registrar General's classification of social class. In contrast, Scandinavian studies (predominantly Swedish) assessed the relation between suicide and population income, and in two instances (Ferrada-Noli 1997a; 1997b), social or economic care measures were also included.

A range of different populations were studied. While some studies aggregated all cases of suicide, at least two out of every three studies included demographic-specific effects. The majority of studies examined males and females separately, and excluded very young ages. A few studies presented results only for fairly narrow age bands (Barlett et al. 2002; Boyle et al. 2005; Crawford and Prince 1999; Evans et al. 2004; Mcloone and Boddy 1994; Shah et al. 2002).

Those studies that did not provide demographic-specific results showed diverse results. Greater socioeconomic deprivation, as measured by the Townsend Index in Bristol (Gunnell et al. 1995) and by the Jarman Under-Privileged Areas and MINI Deprivation Scores in London (Kennedy et al. 1999), was strongly associated with higher suicide. Yet, in another Bristol study, also using the Townsend Index, no association between deprivation and suicide was found either before or after adjusting for social fragmentation and psychiatric admission rates (Evans et al. 2004). The latter study focused on ages 15-44 years rather than all ages as in the other two studies.

A series of studies in Sweden (Ferrada-Noli 1997a; 1997b; Ferrada-Noli and Asberg 1997; Lester and Salvid 1997a; 1997b) showed mixed results depending on the definition of the SES measure used. Analyses tended to produce non-significant results (Ferrada-Noli 1997a; 1997b; Ferrada-Noli and Asberg 1997; Lester and Salvid 1997a; 1997b) but there was some evidence for higher suicide with less favourable socioeconomic resources (Ferrada-Noli 1997a; 1997b). For a similar time period in Norway (1986-1990), there was also no correlation between suicide and income (Lester 1999).

**Gender- and age-specific findings.** Results tended to differ according to the specific groups examined. In a Scottish study that presented results only for both genders combined aged 20-29 years, Mcloone and Boddy (1994) found that suicides rates were significantly higher in the most deprived areas, with no difference between lower deprivation categories. Yet, in a study looking only at young men in England,

Crawford and Prince (1999) reported that areas experiencing the lowest increase in rates of suicide were those with the highest levels of social deprivation (households without access to a car/van).

A few studies found differing results for males and females. Among the elderly in the UK, there was no association between deprivation level and drug overdose suicide for females, and an inverse relation for males at an intermediate level only (Shah et al. 2002). In Sweden, suicide rates were positively associated with income for females only in 1980 (Lester and Salvid 1997a), yet for males only between 1975-1985 (Lester and Salvid 1997b).

Yet, for the most part, the association between area-level SES and suicide was broadly in the same direction for males and females. In the UK (Hawton et al. 2001; Renvoize and Clayden 1990) and Slovenia (Marušič 1998) suicide was not significantly associated with SES for either gender; while for the majority of studies, both males and females had an increased suicide risk with higher levels of deprivation (Barlett et al. 2002; Congdon 1996; Middleton et al. 2004; Rezaeian et al. 2005). However, inconsistencies were evident across age categories (Congdon 1996; Middleton et al. 2004; Rezaeian et al. 2005, Whitley et al. 1999), time periods (Congdon 1996) or SES measures (Rezaeian et al. 2005), that were not only more apparent among females but suicide by females tended to be less strongly associated with area SES (Congdon 1996; Barlett et al. 2002; Middleton et al. 2004).

This weaker effect of SES on suicide among females may be changing with time, particularly for youth. In Great Britain, after adjusting for social fragmentation, an increase in the Townsend score between 1981 and 1991 was associated with a significant increase in the suicide rate for young females only (Whitley et al. 1999). Also, in their study that assessed changes in suicide across time in Scotland, Boyle and others (2005) found that the suicide gap between the most and least deprived areas widened between 1980-1982 and 1999-2001 more for young women, while for young men the rates rose in every fifth, with a particularly large and significant rise in the most deprived fifth.

Most studies reported that the negative effect of deprivation was greatest in younger age groups (Congdon 1996; Barlett et al. 2002; Middleton et al. 2004; Rezaeian et al. 2005; Whitley et al. 1999), particularly for males. Furthermore, the suicide gap between the least and most deprived increased across time much more among young adults (15-44 years) than among older ages (45+ years) (Boyle et al. 2005). Some British studies even reported a reversal of the association in older ages, with increased deprivation associated with decreased suicide risk (Congdon 1996; Whitley et al. 1999). These patterns were not evident in Slovenia, however, where not only was income associated with suicide among the elderly rather than younger age groups, but also for this older group, increased income was associated with decreased suicide (Marušič 1998).

***Studies from outside Europe.*** The majority of studies from outside Europe that examined ecological associations of SES and suicide were conducted in the USA and Australia. Others came from Canada, Asia and Africa. A variety, and typically a combination, of SES measures were used, with income, and related poverty and insurance measures, most common. Australian studies usually used existing SES indexes.

As for European studies, a variety of study populations were covered. Almost half of the included studies did not provide demographic-specific results, the majority of which came from the USA and showed conflicting results. Early data at the state level showed no association between education and suicide in 1976 (Saucer 1993); and a positive correlation between family income and suicide (1959-1961), but only for those migrating from afar (Lester 1995). For Indian Health Service areas (1979-1981), Young (1990) found a positive correlation between poverty and suicide.

More recent data from the USA also showed wide variations. Studies have found no association between suicide and education (Cohen et al. 2003) or income (Kunze and Anderson 2002; Tondo et al. 2006); as well as lower suicide risks with higher education and income (Abel and Kruger 2005). Suicide was not associated with poverty at the state (Abel and Kruger 2005; Kunze and Anderson 2002) or city (Cohen et



al. 2003) level; yet boarded-up housing, as a proxy for neighbourhood deterioration in large USA cities, remained a predictor of suicide rates after controlling for sociodemographic factors (Cohen et al. 2003). Zimmerman (1995) found that suicide was higher in states that spent less for public welfare, but only in more recent years (1985 and 1990), and in 1990, this was the only variable that accounted for widening differences in states' suicide rates. Similarly, in 2001 the state rate of federal aid for mental health was the strongest predictor of suicide, followed by the rate of uninsured persons (Tondo et al. 2006).

Across Canadian census divisions Hasselback and colleagues (1991) found a negative relationship between suicide and income after adjustment for several other sociodemographic and socioeconomic variables, while occupation and education were not predictors. In contrast, a study in Japan found that income was not a predictor of the suicide rate across prefectures (Nishimura et al. 2004).

***Gender- and age-specific findings.*** Only two studies found similar effects of area-level SES on the suicide risk for males and females. Across metropolitan statistical areas of the USA, increasing median family income was associated with increasing suicide for males and females in 1970 but not 1980 (Burr et al. 1997). In a South African study that included gender- and race-specific outcomes, there was a gradient of increasing suicide risk with increasing socioeconomic circumstances for males and females, but only the lowest level of socioeconomic circumstances was protective for whites, with no effect for blacks (Burrows et al. 2005).

All studies in Australia found some differences in results for males and females, with greater effects typically evident for males. In Sydney, Australia, results differed substantially across education, income and occupation measures and for each gender-specific age group (Burnley 1995). Correlations were on the whole stronger for males than females. Increased suicide was associated with lower income for middle-aged males (25-64 years); a higher proportion of labourers for elderly males and females; and lower education for elderly females; as well as higher income for elderly females; higher education for young (15-24 years) and older (40-74 years) males, and younger females (15-39 years) (Burnley 1995).

In both Queensland (Cantor et al. 1995) and New South Wales (Taylor et al. 1998), males and females showed increasing suicide with greater disadvantage but there was less significance in the association for females. Suicide rates of older people (aged 55+) in Queensland were least influenced by these factors (Cantor et al. 1995). In New South Wales, SES differentials in male suicides varied by country-of-birth and controlling for this variable strengthened the relationship between male suicide and SES. Male youth (aged 15-24) showed similar effects as their older counterparts, while SES was not significant for female youth suicides (Taylor et al. 1998).

In studies covering the whole of Australia, one found that after adjusting for age, country-of-birth and urban-rural residence, male suicide was positively associated with all three measures of SES; while female suicide was positively associated with the Index of Economic Resources, negatively with the Index of Education and Occupation, and because of this was not associated with the overall measure of SES (Page et al. 2002). In another study, a significant increasing gradient from high to low SES was evident for males only, both for the total group and for youth aged 20-34 (Taylor et al. 2005). A study by Turrell and Mathers (2001) focused on describing the trends in socioeconomic mortality inequality from 1985-1987 to 1995-1997. There were decreases in inequality for females (ages 15-24, 25-64) and males aged 25-64 years, but an increase among young males (aged 15-24).

Studies in Asia found that while the associations between SES and suicide were in the same direction for males and females, the strength and the consistency of the effect varied. In 23 cities and counties in Taiwan, suicide increased with higher income per capita for males and females, and with increased poverty only for females and the total population (Chaung and Huang 1997). In Japan, two studies included all 47 prefectures, and one examined Osaka prefecture. The latter study used public assistance rate as a measure of local poverty, and found moderate to strong associations between suicide and public assistance for both males and females, with effects generally greater among men and those aged 40-64 years (Aihara and Iki 2002). In the study across all prefectures, the male SMR was negatively associated

with the amount of household savings, public assistance rate and income, although this was not consistent across all years examined; while the female SMR was negatively associated only with the public assistance rate (Aihara and Iki 2003). In the other study (Yamasaki et al. 2005) a high income factor correlated negatively with the suicide rate for males and females but the effect was stronger and more consistent across age and time for males.

In an 11-year review in British Columbia, Canada, low education (in both cross-sectional and longitudinal analyses) and high family income (in longitudinal analyses) were associated with increased suicide risk for elderly females, but not for males (Agbayewa et al. 1998).

### **Area-based socioeconomic disparities and suicide morbidity**

**European studies.** Very few European studies examined the impact of area-based deprivation on the risk of non-fatal suicidal behaviour. They came almost exclusively from the United Kingdom, all of which used the Townsend Deprivation Index as a measure of inequality. The only study from outside of the UK, conducted in Helsinki, Finland, used the proportion of persons with high education and proportion of social assistance cases as its measures (Ostamo et al. 2002). The majority of studies presented separate results for males and females. Only one study focused on children and adolescents (Ayton et al. 2003), the others included all ages except the very young.

All studies showed that cross-sectionally the risk of non-fatal suicidal behaviour increased with increased deprivation, although Hawton and colleagues (2001) found that this effect was attenuated or made insignificant for some gender- and age-specific groups after adjustment for social fragmentation. Socioeconomic deprivation tended to have a greater influence on male than female rates (Congdon 1996; Gunnell et al. 2000; Hawton et al. 2001) and on young to middle rather than older age groups (Congdon 1996; Gunnell et al. 2000; Hawton et al. 2001). Gunnell and others (2000) additionally assessed whether changes in the Townsend Index were also associated with increases in deliberate self-harm. This association was statistically significant only for 25-34 year-old females and did not greatly alter when changes in social fragmentation were controlled for, except that the association in 15-24 year-old females also became significant. The studies that compared results across two different time periods (Gunnell et al. 2000; Ostamo 2002) both found that associations between socioeconomic status and suicidal behaviour were generally higher in the 1990s than earlier.

**Studies from outside Europe.** Three studies that examined the impact of area level SES on non-fatal suicidal behaviour in countries outside of Europe were identified. They were conducted in the USA, Canada, and Australia. All showed some evidence of increasing suicide attempt risk with greater disadvantage. In northern Manhattan (Durkin et al. 1994), moderately low income tracts had higher risk for self-inflicted injuries for those aged under 17 years (resulting in hospitalisation or death), but largely low income tracts did not. For ages older than 14 years, the parasuicide rate decreased as average income increased in Canada (Newman and Stuart 2005). In Australia, significant increasing gradients were evident from high to low SES groups for prevalences of suicide attempts for males and females (Taylor et al. 2005).

### **Multilevel studies**

**European studies.** Only one European multilevel study was found that examined suicide. In Barcelona, Spain, Borrell and others (2002) used education at the individual level and the percentage of unemployed and percentage of men in jail at the area level. There were higher suicide risks for lower education for males only and no neighbourhood influence was found (after adjustment).

**Studies from outside Europe.** Two multilevel studies were from the USA and one from New Zealand. In the USA (Cubbin et al. 2000b), neighbourhood income and poverty, but not education or occupation,

had significant effects on the risk of suicide. The individual hazard ratios remain essentially unchanged in the presence of neighbourhood characteristics, and there was little or no attenuation with the introduction of individual SES. In New York (Miller et al. 2005), after adjusting for individual demographic characteristics, area level income per capita was not associated with suicide risk, while income inequality was associated with an increased likelihood of suicide among persons 15-34 years, but not among those age between 35-64. The association between regional income inequality and suicide was assessed while controlling for individual income in New Zealand (Blakely et al. 2003). No association was found for men or women.

### **Multi-country studies**

Three studies examined socioeconomic inequalities in suicide across European countries. One of these (Lorant et al. 2005a) included educational status (for 10 countries) and housing tenure (6 countries). They found that in most settings the suicide level increased with increasing disadvantage. Socioeconomic inequalities were pervasive in all male populations (except in Turin); inequalities were less pronounced in women and in some cases even reversed, especially when education was considered; and housing tenure seemed to be a more important risk factor than education and yielded more consistent results between genders. A second study (Lorant et al. 2005b) examined whether being married was a protective factor against inequalities in suicide. European countries or regions evidenced varying socioeconomic inequalities in suicide, with Finland, Austria and Madrid having higher inequality. Marriage protected lower socioeconomic individuals to a greater extent and socioeconomic inequalities were smaller among married individuals than among non-married. The buffering effect of marriage was not observed for elderly individuals. A further study comparing France and Spain (Lostao et al. 2006) found that differences in suicide for men by occupational status depended upon both the nation and time period studied, but that for the most part, lower suicide rates were associated with higher status, and effects were stronger in the second time period and in France.

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**Table 10.1 Individual level analyses: studies on suicide mortality within Europe**

RELATION BETWEEN SUICIDE & SES*	DEMOGRAPHIC-SPECIFIC RESULTS	SES MEASURE	PLACE; DATE	STUDY REFERENCE
<b>SUICIDE MORTALITY</b>				
Direct	Cases aged 5-25	Parental socioeconomic status (5 levels)	Sweden; 1985 to 1991-1995	Hjern & Bremberg 2002
Inverse before and after adjustment	Cases aged 20-64	Housing tenure (proxy for social class-2 levels)	Sweden; 1979-1985 to 1993	Johansson & Sundquist 1997
Inverse	Males aged 20-64	Social class (6 levels)	UK, England and Wales; 1991-1993	Drever et al. 1996
Inverse for income and wealth, none for education before adjustment; none after adjustment	All cases	Education (3 levels); income (4 levels), wealth (3 levels)	Denmark; 1982-1994	Mortensen et al. 2000
Inverse for housing tenure and car access, none for education and occupation	Cases aged 16-84	Education (2 levels), social class (2 levels), housing tenure (proxy for social class-2 levels), car access (2 levels)	Sweden; 1979-1985 to 1993	Johansson et al. 1997a
Inverse before adjustment, none after adjustment	Cases aged 10-26	Maternal education (3 levels)	Sweden; 1973-1980 to 1999	Mittendorfer-Rutz et al. 2004
Inverse for education, mixed for occupation: varies by gender, before adjustment; none after adjustment	Males and females aged 65+	Education (2 levels); occupation (4 levels)	Sweden, Göteborg-Bohuslän, Älvsborg; 1994-1996	Rubelowitz et al. 2001
Mixed before (mostly inverse) and after (mostly none) full adjustment: varies by measure	Cases aged 10+	Education (2 levels); social class (5 levels), car access (2 levels); housing tenure (3 levels)	UK, England and Wales; 1971-1980, 1981-1992	Lewis & Sloggett 1998
Mixed: varies by measure	Males aged 45-59	Education (4 levels), occupation (2 levels)	Lithuania; 1971-2000	Tamosiunas et al. 2005
Mixed: varies by admission status	All cases (by hospitalisation for psychiatric disorder status)	Income (4 levels)	Denmark; 1982-1994	Agerbo et al. 2001
Mixed before and after adjustment: varies by measure	Cases aged 10-21	Parental education (4 levels) & income (2 levels), sibling education (3 levels)	Denmark; 1981-1997	Agerbo et al. 2002
Mixed before adjustment: varies by gender and measure; none after adjustment	Males and females all ages	Education (3 levels), income (4 levels), wealth (3 levels)	Denmark; 1982-1994	Qin et al. 2000
Mixed after adjustment: varies by gender and measure	Males, females & combined all ages	Income (4 levels), wealth (4 levels)	Denmark; 1981-1997	Qin et al. 2003
Mixed: varies by gender, age and measure	Males and females aged 20-29, 30-49, 50+	Housing tenure (proxy for social class-2 levels) Overcrowding as proxy for wealth (2 levels)	Sweden; 1985-1989	Johansson et al. 1997b
None	Cases aged 11-15	Parental social class (2 levels)	UK, England and Wales; 1980-1983, 1992-1995	Roberts et al. 1998

**Table 10. Individual level analyses: studies on suicide morbidity within Europe**

RELATION BETWEEN SUICIDE & SES*	Demographic-specific results	SES MEASURE	PLACE; DATE	Study reference
<b>SUICIDE MORBIDITY</b>				
Inverse	Cases aged 10-20 from selected schools	Parental education (2 measures, continuous)	Turkey, Mersin; 2002	Toros et al. 2004
Inverse	Medically treated males and females aged 15-64	Education (4 levels)	The Netherlands, Leiden; 1989-1992	Arensman et al. 1995
Inverse except intermediate level for females	Male, female and combined repeat attempters aged 10+ from university clinics	Education (3 levels)	Hungary; 1997-2001	Osváth et al. 2003
Inverse for hospitalised attempts; none for non-hospitalised adolescents	Hospitalised vs self-reported attempts aged 13-19	Parental social class incl. unemployment (6 levels)	Norway, Oslo; 1993-1994	Grøholt et al. 2000
Mixed: varies by gender and age	Hospitalised and death cases aged 10-14, 15-19	Parental social class (4 levels)	Sweden; 1990-1994	Engström & Laflamme 2002
Mixed: varies by age	Hospitalised and death cases aged 10-14, 15-19	Parental social class (4 levels)	Sweden; 1990-1994	Engström et al. 2002
Mixed: varies by gender	Hospitalised and death males and females aged 10-14, 15-19	Parental social class (4 levels)	Sweden; 1990-1994 (by year)	Engström et al. 2003
Mixed: varies by gender and measure	Hospitalised and death males and females aged 10-19	Parental social class (6 levels), receipt of welfare benefits (2 levels)	Sweden; 1990-1994	Engström et al. 2004
Inverse before and after adjustment, none after adjustment	Hospitalised cases aged 10-26	Maternal education (3 levels)	Sweden: 1973-1980 to 1999	Mittendorfer-Rutz et al. 2004
None for parental education, inverse for own education	Hospitalised first attempts aged 14-27	Parental education (2 measures, 2 levels each), own education (2 measures, 2 levels each)	Denmark; 1966, 1981-1993	Christoffersen et al. 2003
None	Cases aged 14-19 from selected schools	Parental education (2 measures, 2 levels)	Slovenia; 1995/1996, The Netherlands; 1991/1992	Tomori et al. 2001

\* Only results significant at or below the 0.05  $\alpha$ -level are reported; 'Direct relationship' implies that a higher suicide rate is significantly associated with higher individual socio-economic status; 'inverse relationship' implies that a higher suicide rate is significantly associated with lower individual socio-economic status

**Table 11.1 Individual level analyses: studies on suicide mortality outside Europe**

RELATION BETWEEN SUICIDE & SES*	DEMOGRAPHIC-SPECIFIC RESULTS	SES MEASURE	PLACE; DATE	STUDY REFERENCE
<b>SUICIDE MORTALITY</b>				
Inverse	Hospitalised suicide attempters aged under 60 at baseline	Proxy: income (2 levels)	Canada, Calgary; 1979-1989	Holley et al. 1998
Inverse	Males aged 25-64	Occupational status (5 levels)	Australia, New South Wales; 1986-1989	Burnley 1995
Inverse for males and females before and after adjustment	Males and females aged 20-64	Social class (4 levels)	Korea; 1999-2001	Kim et al. 2006
Inverse before and after adjustment	All cases	Education(2 levels), income (2 levels)	New Zealand, Canterbury; 1991-1995	Beautrais 2001
Inverse before adjustment; inverse for education and none for occupation after adjustment	Cases aged under 25	Education (2 levels), socioeconomic status (2 levels)	New Zealand, Canterbury; 1991-1995	Beautrais 2003
Mixed before adjustment: varies by gender and measure; none after adjustment	Males, females and combined aged 18-64	Education (2 levels); income (4 levels); occupation (2 levels),	USA; 1987-1994 to 1995	Cubbin et al. 2000
Mixed: varies by race and measure	Caucasians and African-Americans aged 25-64	Education (2 levels); occupation (2 levels)	USA; 1986	Kung et al. 1998
Mixed: varies by gender	Males and females aged 15-64	Education (2 levels)	USA; 1993	Kung et al. 2003
Mixed: varies by gender	Males and females aged 30-59	Occupational status (2 levels)	China, Hong Kong; 1990-1992, 2000-2002	Kwan et al. 2005
Mixed: varies by gender	Males and females aged 15-89	Education (4 levels)	USA, California; 1977-1985 to 1993	Iribarren et al. 2000
Mixed: varies by gender	Males and females aged 20-64	Socioeconomic status (4 levels)	USA, 27 states; 1984-1997	Steenland et al. 2003
Mixed before and after full adjustment: varies by occupation level	Cases aged 15+	Occupation (10 levels)	USA; 1979-1989	Kposowa 1999
Mixed before and after adjustment: varies by gender, age and measure	Males and females aged 18-24, 25-44,45-64	Education (4 categories); income (4 categories), car access (3 levels)	New Zealand; 1991	Blakely et al. 2003
Mixed: varies by gender and measure	Males and females aged 25-64	Education (4 levels), income (4 levels); car access (3 levels); NZDep91 small area deprivation (proxy for individual status-5 levels)	New Zealand; 1991-1994	Blakely et al. 2002
None before or after adjustment	Cases aged 0-17 at baseline	Education (4 levels); income (1 level)	USA; 1979-1989	Hussey 1997
None	All cases	Occupation (7 levels)	China, Hong Kong; 1980-1994	Yan 2000
None	All cases	Education (continuous), income (continuous)	China, Jonzhou, Zhuanghe; 2001-2002	Zhang et al. 2004

**Table 11.2 Individual level analyses: studies on suicide morbidity outside Europe**

RELATION BETWEEN SUICIDE & SES*	Demographic-specific results	SES measure	Place; Date	Study reference
<b>SUICIDE MORBIDITY</b>				
Direct	Hospitalised attempts aged 15+	Education (3 levels), socioeconomic class (3 levels)	Uganda, Kampala; 2002	Kinyanda et al. 2004
Direct for maternal education, none for paternal education and occupation	Hospitalised overdose attempts aged 15-24	Parental education (2 measures, 2 levels each), social class (5 levels)	Bahrain; 1993-1994	Al Ansari et al. 2001
Inverse	Hospitalised males and females aged 15-89	Education (4 levels)	USA, California; 1977-1993	Iribarren et al. 2000
Inverse before and after adjustment	Cases aged 18+ in survey population	SES index (education, income, occupational prestige) (4 levels)	USA, Baltimore; 1981,1982, 1993-1996	Kuo et al. 2001
Inverse before and after adjustment	Medically serious hospitalised attempts aged 13-24	Education (1 level); income (1 level)	New Zealand, Christchurch; 1991-1994	Beautrais et al. 1996
Inverse before and after adjustment	Medically serious hospitalised attempts aged under 25	Education(2 levels), income (2 levels)	New Zealand, Canterbury; 1991-1994	Beautrais 2001
Inverse for Hawaiians, none for non-Hawaiians	Hawaiian vs non-Hawaiian adolescents from selected schools	Main wage earner's education (2 levels)	USA, Hawaii; 1993-1994	Yuen et al. 2000
Inverse for education and occupation before and after adjustment, none for income	Medically serious hospitalised attempts cases aged under 25	Education (3 levels), income (3 levels), socioeconomic status (3 levels)	New Zealand, Christchurch; 1991-1994	Beautrais et al. 1998
Inverse before adjustment; inverse for education and none for occupation after adjustment	Medically serious hospitalised attempts aged under 25	Education (2 levels), socioeconomic status (2 levels)	New Zealand, Canterbury; 1991-1995	Beautrais et al. 2003
Inverse for occupation, income and education-occupation measure before and after full adjustment; none for education	Males and females all ages, 20-64 in survey population	Education (4 levels), occupational status (4 levels), combined education-occupation (7 levels); income (2 levels)	Australia; 1997	Taylor et al. 2004
Inverse for income, none for education and occupation before and after adjustment	Cases aged 11-21 from selected schools	Parental education (5 levels), parental occupation (2 levels), income (5 levels)	USA; no date	Goodman 1999
Inverse before adjustment; mixed after adjustment: varies by gender and measure	Males and females aged 17-39 in survey population	Education (4 levels), Income (3 levels)	USA; 1988-1994	Zhang et al. 2005
Mixed before adjustment: varies by measure; none after adjustment	All cases in survey population	Education (2 measures, 2 levels each)	USA, New Haven, Baltimore, St Louis, Durham, Los Angeles; 1980-1984	Petronis et al. 1990
Mixed before adjustment: varies by gender and measure; inverse for maternal, none for paternal, education after adjustment	Males, females and combined aged 14-20 from selected schools	Parental education (2 measures, 3 levels)	Canada, Nova Scotia; 2000	Langille et al. 2003
None	Cases aged 11-18 from selected schools	Parental education (3 levels)	Ethiopia, Addis Ababa; 1990	Kebede & Ketsela 1993

\* Only results significant at or below the 0.05  $\alpha$ -level are reported; 'Direct relationship' implies that a higher suicide rate is significantly associated with higher individual socio-economic status; 'inverse relationship' implies that a higher suicide rate is significantly associated with lower individual socio-economic status

**Table 12.1 Area-based Analyses: studies on suicide mortality within Europe**

RELATION BETWEEN SUICIDE & SES*	DEMOGRAPHIC-SPECIFIC RESULTS	SES MEASURE	AREA DIVISION	PLACE; DATE	STUDY REFERENCE
<b>SUICIDE MORTALITY</b>					
Direct	Males aged 15-44	Car access as proxy for deprivation (4 levels)	County district	UK, England; 1979-1985, 1986-1992	Crawford & Prince 1999
Inverse	All cases	Income (continuous)	Counties	Norway; 1986-1990	Lester 1999
Inverse for all groups	Males and females aged 15+ and 15-44	Jarman under-privileged areas score (continuous)	Health authorities	UK, England; 1993-1994	Barlett et al. 2002
Inverse	All cases	Townsend deprivation score (continuous)	Local authorities	UK, Bristol; 1982-1991	Gunnell et al 1995
Inverse before and after adjustment	All cases	Jarman under-privileged areas score (continuous); Mental Illness Needs Index (continuous)	Boroughs	UK, London; 1993-1996	Kennedy et al. 1999
Mixed: varies by gender, age and measure	Males and females aged 10-29, 30-49, 50+	Indices of Deprivation – Income scale, Employment scale, Local concentration (4 levels)	Local authority	UK, England; 1996-1998	Rezaeian et al. 2005
Inverse for most deprived category in second time period only	Ages 20-29	Carstairs deprivation score (3 levels)	Postcode sectors	UK, Scotland; 1980-1982, 1990-1992	McLoone & Boddy 1994
Inverse	Males and females aged 15-44	Carstairs deprivation score (5 levels)	Postcode sectors	UK, Scotland; 1980-1982, 1999-2001	Boyle et al. 2005
Mixed before (mostly inverse) and after adjustment: varies by gender and age	Males and females aged <25, 25-44, 45-64, 65+	Townsend deprivation score (continuous)	Parliamentary constituencies	UK, Great Britain; 1981-1992	Whitley et al. 1999
Mixed (mostly inverse): varies by gender, age and geographic level	Males and females, ages 15-59, 60+	Townsend deprivation score (continuous); social class (2 levels)	Wards and boroughs	UK, London; 1990-1992	Congdon 1996
Mixed before adjustment: varies by gender; none after adjustment	Males and females aged 15+	Townsend deprivation index (continuous)	Electoral wards	UK, Oxford; 1985-1995	Hawton et al. 2001
Mixed before (mostly inverse) and after (mostly no association) adjustment: varies by gender and age	Males and females aged 15-44, 45-64, 65+	Townsend deprivation index and its components; social class (4 levels)	Electoral wards	UK, England and Wales; 1991-1993	Middleton et al. 2004
Mixed: varies by age	Males and females; ages 10-29, 30-59, 60+	Income (continuous)	Communes	Slovenia; 1985-1994	Marušič 1998
Mixed: varies by gender	Males, females and combined aged 20+	Income (continuous)	Counties	Sweden; 1975-1985	Lester & Salvid 1997a
Mixed: varies by gender	Males, females and combined	Income (continuous)	Counties	Sweden; 1980	Lester & Salvid 1997b
Mixed: varies by measure	All cases	Income (2 measures), households receiving social or economic care (continuous), budget spent on social care (continuous)	Counties (6 with highest suicide rates)	Sweden; 1990	Ferrada-Noli 1997a
Mixed: varies by measure	All cases	Income (continuous), social assistance among elderly (continuous)	Municipalities (10 richest and 10 poorest)	Sweden; 1990	Ferrada-Noli 1997b
None	All cases	Income (continuous)	Municipalities (2 richest and 2 poorest)	Sweden, Stockholm; 1987-1990	Ferrada-Noli & Asberg 1997
None for either gender or geographic level	Males, females and combined aged 15+	Jarman under-privileged areas score (continuous)	Regional and district health authorities	UK, Yorkshire and England; 1979-1985	Renvoize & Clayden 1990
Mixed: varies by gender	Male and female overdoses aged 65+	Carstairs deprivation score (5 levels)	Enumeration districts	UK, England and Wales; 1993-1999	Shah et al. 2002
None before or after adjustment	Cases aged 15-44	Townsend deprivation index (4 levels)	Electoral wards	UK, Bristol; 1991-1992	Evans et al. 2004

**Table 12.2 Area-based Analyses: studies on suicide morbidity within Europe**

SUICIDE MORBIDITY					
Inverse	Hospitalised cases aged 10+ years	Townsend deprivation score (continuous)	Local authorities (postcode)	UK, Bristol; 1990-1994	Gunnell et al. 1995
Inverse	Hospitalised males and females, ages 15-29,30-59, 60+	Townsend deprivation score (continuous); social class (2 levels)	Wards, boroughs	UK, London; 1990-1992	Congdon 1996
Inverse before and after adjustment	Hospitalised DSH patients aged under 18	Townsend deprivation score	Electoral wards	UK, Hull and East Yorkshire; 1996-1998	Ayton et al. 2003
Inverse	Healthcare-treated males and females aged 15+	Education (2 levels), social assistance (2 levels)	Districts	Finland, Helsinki; 1989, 1997	Ostamo et al. 2002
Inverse for all groups before adjustment; mixed after adjustment: varies by gender and age	Hospitalised males and females aged 15+, 15-24, 25-34, 35-54, 55+	Townsend deprivation index (continuous)	Electoral wards	UK, Oxford; 1985-1995	Hawton et al. 2001
Inverse for all groups and time periods before adjustment; mixed after adjustment: varies by gender and age	Hospitalised male and female DSH patients aged 15-24; 25-34, 35+	Townsend deprivation score (continuous)	Wards	UK, Bristol; 1972-1973, 1995-1996	Gunnell et al. 2000

\* Only results significant at or below the 0.05  $\alpha$ -level are reported; 'Direct relationship' implies that a higher suicide rate is significantly associated with higher area socio-economic status; 'inverse relationship' implies that a higher suicide rate is significantly associated with lower area socio-economic status

**Table 13.1 Studies outside Europe on suicide mortality and morbidity**

RELATION BETWEEN SUICIDE & SES*	DEMOGRAPHIC-SPECIFIC RESULTS	SES MEASURE	AREA DIVISION	PLACE; DATE	STUDY REFERENCE
<b>SUICIDE MORTALITY</b>					
Inverse	Males, females and combined; ages 15-29, 30-54, 55+	Socio-Economic Indexes For Areas (5 levels)	Statistical local area	Australia, Queensland; 1990-1992	Cantor et al. 1995
Inverse	All cases	Poverty (continuous)	Indian Health Service Areas	USA; 1979-1981	Young 1990
Inverse	Males and females aged 15-39, 40-64, 65+	Public assistance	Sub-areas	Japan, Osaka prefecture; 1980-1997	Aihara & Iki 2002
Mixed (mostly inverse): varies by gender, age and time	Males and females aged 15-24, 25-34, 45-54, 55-64, 65+	Income factor	Prefectures	Japan; 1980, 1985, 1990	Yamasaki et al. 2005
Mixed: varies by race	Males, females, whites and blacks aged 15+	Socioeconomic circumstances (3 levels)	Residential areas	South Africa, Tshwane; 2000-2001	Burrows & Laflamme 2005
Mixed (mostly inverse): varies by gender and measure	Males, females and combined aged 15+	Income (continuous); poverty (continuous)	Cities and counties	Taiwan; 1983-1993	Chuang & Huang 1997
Mixed: varies by measure	All cases	Income (continuous), federal aid for mental health (continuous), health insurance (continuous)	States and DC	USA; 2001	Tondo et al. 2006
Mixed (mostly inverse): varies by gender, age and time	Males and females aged 15-24, 25-64	Index of Relative Socio-Economic Disadvantage (5 levels)	Statistical local area	Australia; 1985-1987, 1995-1997	Turrell & Mathers 2001
Mixed: varies by measure	All cases	Education (continuous); income (continuous); occupation (continuous)	Census divisions	Canada 1980-1986	Hasselback et al. 1991

RELATION BETWEEN SUICIDE & SES*	DEMOGRAPHIC-SPECIFIC RESULTS	SES MEASURE	AREA DIVISION	PLACE; DATE	STUDY REFERENCE
Mixed: varies by gender and measure	Males, females and combined aged 65+	Education (2 levels), income (2 measures - continuous)	Health units	Canada, British Columbia; 1981-1991	Agbayewa et al. 1998
Mixed: varies by time period	Males and females	Income (continuous)	Metropolitan statistical areas	USA; 1970, 1980	Burr et al. 1997
Mixed: varies by measure	All cases aged under 65	Education, poverty index, boarded-up housing (proxy for neighbourhood deterioration)	Cities with populations >150000	USA; 1990	Cohen et al. 2003
Inverse for later time periods only	All cases	Public welfare expenditures (continuous)	States	USA; 1970, 1980, 1985, 1990	Zimmerman 1995
Mixed: varies by place of birth	All cases, by place of birth	Income (continuous)	States	USA; 1959-1961	Lester 1995
Mixed: varies with measure	All cases	Education (continuous), income (continuous), poverty (continuous)	States	USA; 2001	Abel & Kruger 2005
Mixed: varies by gender, age and measure	Males and females aged 15-24, 25-39, 40-64, 65-74	Education (1 level), income (2 levels), occupation (1 level)	Statistical local area	Australia, Sydney 1986-1989	Burnley 1995
Mixed: varies by gender	Males and females aged 15-24, 15+ by COB	Socio-Economic Indexes For Areas (5 levels)	Urban municipalities	Australia, New South Wales; 1985-1994	Taylor et al. 1998
Mixed: varies by gender	Males and females aged 20+, 20-34	Index of Relative Socio-Economic Disadvantage (5 levels)	Census collection district	Australia; 1996-1998	Taylor et al. 2005
Mixed: varies by gender	Males and females aged 15+	Index of Relative Socio-Economic Disadvantage (5 levels), Index of Economic Resources (5 levels), Index of Education and Occupation (5 levels)	Local government areas	Australia; 1994-1998	Page et al. 2002
Mixed: varies by gender and measure	Male and females	Income (continuous), public assistance (continuous), bankruptcy (continuous), savings (continuous)	Prefectures	Japan; 1995-2000 (by year)	Aihara & Iki 2003
None	All cases	Income (continuous)	Prefectures	Japan; 2000	Nishimura et al. 2004
None	All cases	Income (continuous), poverty (continuous)	States and DC	USA; 1985-1995	Kunze & Anderson 2002
None	All cases	Education (2 levels)	States and DC	USA; 1976	Saucer 1993
<b>SUICIDE MORBIDITY</b>					
Inverse	Emergency department visits aged 15+	Income (continuous), education (continuous)	Income regions'	Canada, Edmonton, Calgary; 1996-1997	Newman & Stuart 2005
Inverse for intermediate level only	Hospitalised and death cases aged under 17	Income (3 levels)	Census tract	USA, Northern Manhattan; 1983-1992	Durkin et al. 1994
Inverse for males and females	Males and females aged 20+, 20-34, 35-64, 65+	Index of Relative Socio-Economic Disadvantage (5 levels)	Census collection district	Australia; 1996-1998	Taylor et al. 2005

\* Only results significant at or below the 0.05  $\alpha$ -level are reported; 'Direct relationship' implies that a higher suicide rate is significantly associated with higher area socio-economic status; 'inverse relationship' implies that a higher suicide rate is significantly associated with lower area socio-economic status



**Table 14 Multilevel Analyses: studies within Europe**

RELATION BETWEEN SUICIDE & SES	DEMOGRAPHIC-SPECIFIC RESULTS	SES MEASURE	PLACE; DATE	STUDY REFERENCE
<b>SUICIDE MORTALITY</b>				
Higher suicide risks for lower education for males only; no neighbourhood influence found	Males and females aged 20-34, 35-74, 75+	Individual: education level (3 levels); Neighbourhood: unemployed men, men in jail (as proxies for deprivation)	Barcelona, Spain; 1992-1998	Borrell et al. 2002

**Table 15 Multilevel Analyses: studies outside Europe**

RELATION BETWEEN SUICIDE & SES	DEMOGRAPHIC-SPECIFIC RESULTS	SES MEASURE	PLACE; DATE	STUDY REFERENCE
<b>SUICIDE MORTALITY</b>				
Neighbourhood income and poverty, but not education or occupation, had significant effects on suicide risk. Individual hazard ratios remain essentially unchanged in the presence of neighbourhood characteristics, and little or no attenuation with the introduction of individual SES	Cases aged 18-64	Individual: education, income, occupation Census Tract: education, income, poverty occupation	USA; 1987-1994	Cubbin et al. 2000b
After adjusting for individual demographic characteristics, area level income not associated with suicide risk, while income inequality associated with an increased risk among persons 15-34 years, but not among those age between 35-64	Cases aged 15-64, 15-34, 35-64	Individual: Gender, age, race/ethnicity Neighbourhood: Income, GINI coefficient	USA, New York; 1996	Miller et al. 2005
No association for males or females after adjusting for individual level factors	Males and females aged 25-64	Individual: income (9 levels), area socioeconomic deprivation Regions: income, GINI coefficient	New Zealand; 1991-1994	Blakely et al. 2003

**Table 16 Country level Analyses**

RELATION BETWEEN SUICIDE & SES	DEMOGRAPHIC-SPECIFIC RESULTS	SES MEASURE	PLACE; DATE	STUDY REF.
<b>SUICIDE MORTALITY</b>				
In most countries, the higher the socioeconomic disadvantage, the higher the suicide. Greater effects for males	Males and females	Individual education, housing tenure	Norway, Finland, Denmark, England and Wales, Belgium, Turin, Switzerland, Austria, Barcelona, Madrid; 1990-1997	Lorant et al. 2005a
Inequality varies across countries, and marriage protects against these inequalities	Ages 30-64, 65+	Individual education	Norway, Finland, Denmark, Belgium, Turin, Switzerland, Austria, Madrid; 1991-1997	Lorant et al. 2005b
With some exceptions, lower status associated with higher suicide. Greater effects in second time period and in France	Males aged 25-44, 45-64	Individual occupational status	France, Spain; 1980-1982, 1988-1990	Lostao et al. 2006



## Chapter 5: Interpersonal violence

### Summary and examples of findings

This section includes four parts, according to the different groups of victims treated in the studies: all ages aggregated or unspecified, children and adolescents, and adults, with intimate partner violence (IPV) a specific sub-division of the latter. Most studies examine intimate partner violence and violence towards children and adolescents.

As shown in the table below, very few studies on socioeconomic disparities and violence come from countries in the WHO European Region. Except for those studies that aggregate all ages or do not specify ages when assessing the impact of socioeconomic disparities on violent injuries, the majority are individual-level studies. They show that lower socioeconomic status (of individuals and areas) is associated with violent injuries, although this can vary across socioeconomic status measures. In addition, neighbourhood socioeconomic status has an impact over and above the effects of individual characteristics in identifying cases of violence towards children and adolescents and adults. With very few exceptions, most studies indicate that while IPV affects women and men from all groups, those with lower socioeconomic status – and in particular with low education – are more at risk than others.

Mortality and morbidity		
	N. of studies	
<b>All ages aggregated/unspecified</b>	10	
Europe	3	UK
Outside Europe	5	Brazil, USA
Multi-country	2	India, Japan, Russia, Sweden, Taiwan, Ukraine, United Kingdom, USA 53 countries from World Health Statistics Annual
Intervention	0	
<b>Children and adolescents*</b>	11	
Europe	3	Israel, Italy
Outside Europe	7	Palestinian Authority, South Africa, USA
Multi-country	1	53 countries from World Health Statistics Annual
Intervention	1	Meta-analysis
<b>Adults*</b>	6	
Europe	0	
Outside Europe	5	USA
Multi-country	1	53 countries from World Health Statistics Annual
Interventions	0	
<b>IPV</b>	20	
Europe	3	Sweden, Turkey
Outside Europe	16	Australia, Bangladesh, Haiti, India, Nicaragua, Sri Lanka, USA
Multi-country	1	Chile, Egypt, India, The Philippines
Intervention	0	

\* Some studies dealt with both children and adolescents and adults, and they are counted twice.

The following table presents examples of studies where positive associations between socioeconomic status and injury were found, considering victim group and country.

Victims	Country	Findings
Children and adolescents		
Studies outside Europe		
	South Africa <sup>1</sup>	A study on sexual abuse among adolescents revealed that family structure was significantly related to rape as persons who lived with a single parent (OR = 1.74) and those who resided with one biological parent and one step parent (OR = 2.59) were more likely to have been victims of sexual abuse than those living with both biological parents. Family SES was marginally significant.
	USA <sup>2</sup>	A study on physical violence against children found that families below 200% of poverty were more likely to engage in physical abuse, although they did not appear more likely to engage in violence in general. By contrast, in single-parent families, those with incomes between 100 and 200% of poverty were significantly more likely to engage in physical abuse than the poorest families (200% of poverty): 14.2% for families at 100-150% and 11.7% for those at 150-200%.
Adults		
Studies outside Europe		
	USA <sup>3</sup>	A multilevel study found an approximately twofold increased risk of homicide associated with living in a neighbourhood characterised by low socioeconomic status, after adjusting for individual demographic and socioeconomic characteristics.
	USA <sup>4</sup>	A study among postmenopausal women found that those with the lowest level of income (not the intermediate levels) had a 2.72 times higher risk of physical abuse than those in the top income bracket. Similarly, service (but not technical) workers had a 1.68 times higher risk than managerial workers. There was no association for education.
Intimate partner violence		
Studies within Europe		
	Sweden <sup>5</sup>	A study of 207 pregnant Swedish born women married to or cohabiting with Swedish born men revealed that 24.5% reported threats and/or acts of violence during the last year, 89.4% had experienced dominance/isolation and 44.4% reported emotional/verbal abuse. Occupational status – but not age, income or education – was significantly correlated to physical violence, dominance/isolation and to emotional/verbal factor.
	Turkey <sup>6</sup>	A study of over 800 pregnant women showed that during pregnancy 31.7% of women were exposed to some form of violence. Emotional violence was the most frequently reported form (26.7%), followed by sexual (9.7%) and physical violence (8.1%). Low education level of husband (OR=1.7) and low family income (OR=1.9) were among the four main predictors of overall violence during pregnancy.
Studies outside Europe		
	Bangladesh <sup>7</sup>	A study conducted in six Bangladesh villages (about 1200 women surveyed) investigated the experience of domestic violence in the past year. The proportion of women who reported experiencing domestic violence was significantly higher among women with a dowry agreement than among women with no such agreement (45% vs. 25%) and among women with a marital household socioeconomic status at or below the median for the sample (42% vs. 22%). No differences were observed for education.
	Haiti <sup>8</sup>	A national study investigated ever-married women's risk of emotional, physical and sexual violence and multiple forms of IPV in the past 12 months. 25% experienced some form of IPV during the past 12 months and 13%, two different forms. Significant positive associations with all forms of violence were found for lack of completion of primary school (ORs=1.9, 2.2, 1.8 respectively) and female decisions on large household purchase made alone (ORs=2.7, 1.7, 1.7). Neighbourhood poverty was additional risk factors for sexual violence (ORs=1.8 and 2.4 for villages with medium and high poverty level compared with low), as was male-dominated financial decision-making (OR=2.5).

1 King et al. 2004; 2 Berger 2005; 3 Cubbin et al. 2000 ; 4 Mouton et al. 2004 ; 5 Hedin & Janson 1999 ; 6 Karaogla et al. 2006; 7 Naved & Persson 2005; 8 Gage 2005

The studies included herein are organised in four main sections representing different victims of violence.

### **All ages aggregated or ages unspecified**

Studies that aggregate all ages when assessing the impact of socioeconomic disparities on violent injuries came predominantly from the UK and the USA, with only one from Brazil.

**European studies.** All European studies identified come from the UK and were conducted at the area level. One study in Britain between 1981 and 2000 (Shaw et al. 2005) demonstrated that increases in murder rates were concentrated in the poorest areas. The other two studies focused on assault cases from Accident and Emergency (A and E) departments. In the West Midlands National Health Service region, those living in the most deprived areas were nearly four times more likely to be admitted than those in the least deprived areas (Downing et al. 2003). Similarly, a very strong relationship between material deprivation and risk of assault was found among male and female patients in Chorley (Howe and Crilly 2001).

**Studies from outside Europe.** Except for one area level study (from Brazil), all studies from outside Europe were conducted in the USA.

Only one individual level study was identified. Using prospective data from a nationally representative sample of USA women, Byrne and colleagues (1999) indicated that, although women's poverty status at baseline was not associated with assault history, women experienced increased risk for new victimization when income was below poverty level. Additionally, women with an assault history who were living above the poverty line initially were at an increased risk of decline into poverty following sexual or physical abuse. No association was found between women's education and prior or new assault.

Each of the three ecological studies from the USA focused on a particular city. In Massachusetts (Krieger et al. 2003), for intentional non-fatal weapon-related injuries, measures of economic deprivation detected the steepest socioeconomic gradients. Gang-related homicide at the community level was closely associated with lower income in the city of Los Angeles (Kyriacou et al. 1999), while socioeconomic status (as an average of 2 ranks: unemployment and proportion receiving social assistance) correlated significantly with violent death incidence or density in New York City (Wallace and Wallace 1998).

In analysing the spatial distribution of homicide by place of residence in Porto Alegre, Brazil, Santos et al. (2006) identified four socioeconomic groups, mainly differentiated by housing indicators. Small areas on the urban periphery in which slums (favelas) were concentrated presented higher homicide rates. Homicide rates were lower in the two groups with higher income and educational level. They also classified the census tracts according to the homicide indicator. In this case, areas were differentiated by the number of household inhabitants per room, income, schooling, and median age.

**Multi-country studies.** A study of eight nations (England and Wales, India, Japan, Russia, Sweden, Taiwan, Ukraine, USA) found that homicide rates were generally higher where per capita income, divorce, suicide and unemployment rates and population size were higher (Lester 2001).

### **Violence towards children and adolescents**

Most studies on socioeconomic status and violence against children and adolescents were conducted outside of Europe, predominantly in the USA. There were a similar number of individual- and area-based studies. The majority of these studies focused on the home environment as the place of violence occurrence but some did not specify any particular location.

**European studies.** Three European studies were identified that met our inclusion criteria, two at the individual level and one area-based. One of the former was a survey conducted in Italy by Bardi and Borgognini-Tarli (2001). The survey was submitted to the families of randomly selected pupils from

kindergartens and primary schools across seven Tuscany provinces to assess the use of minor and severe violence in the resolution of intrafamily conflict. Low income, but not parental education level, had an independent effect on minor violence. The other individual level study, conducted among Arab students in Israel (Haj-Yahia and Ben-Arieh 2000), revealed that father's and mother's low level of education, participant's (young) age, and large family size contributed to explaining mother-to-participant physical aggression. Socioeconomic status did not explain father-to-participant or sibling-to-participant physical aggression.

An ecological study was also conducted in Israel using a nationally representative sample of students in grades 7-11 (Khoury-Kassabri et al. 2004). The socioeconomic status of the school's neighbourhood and of the students had a moderate effect in students' reports of victimization. The percentage of males and school climate characteristics (teachers' support, student participation and school policy) were the strongest predictors.

***Studies from outside Europe.*** Of the four individual-level studies conducted outside of Europe, two were from the USA, one from the Middle East and one from South Africa. Both studies in the USA found that income was related to child abuse. Cappelleri and colleagues (1993) found that family income was a risk factor for both sexual abuse and physical abuse. A logistic regression analysis showed that a gender-by-income interaction distinguished sexual abuse from physical abuse. Berger (2005) found that income was significantly related to violence toward children in single-parent families only. Differences in maternal and paternal education levels were associated with violence in two-parent families, with a higher probability of violence in families with a more educated mother and a less educated father.

One study used a cross-sectional survey among a sample of secondary school Palestinian students (Haj-Yahia and Abdo-Kaloti 2003) and addressed their experiences of physical violence by parents and siblings during childhood and adolescence. Exposure was significantly and positively correlated with parents' levels of education and family income.

In Cape Town, South Africa, King et al. (2004) assessed correlates of sexual assault for both male and female students in Grades 8 and 11. Socioeconomic status was found to be a marginally significant predictor of sexual abuse victimization. Family structure, suicidal behaviour, alcohol use, and anti-social behaviour were predictors of sexual assault while age, drug use, smoking and race were not.

Both ecological studies identified came from the USA and showed some evidence of an inverse relation between socioeconomic status and violence. In a study of youth homicide (ages 15-24 years), correlation analyses of New Jersey's 21 counties suggested that a low level of education and the counties' high urbanization index were key risk factors (Najem et al. 2004). Poverty was also an important risk factor for assault in Chicago (Powell and Tanz 1999), where the income was lower and the prevalence of poverty greater in areas with higher fatal and non-fatal assault rates. Black and Hispanic youth living in poverty were at particular risk.

In the only study using a multilevel analysis, Coulton and colleagues (1999) examined neighbourhood structural conditions and individual risk factors for child abuse and neglect. Parents of children under the age of 18 were systematically selected from randomly selected census-defined block groups with different risk profiles for child maltreatment report rates. Neighbourhood factors of impoverishment and child care burden significantly affected child abuse potential after controlling for individual risk factors. Adverse neighbourhood conditions weakened the effects of known individual risk and protective factors, such as violence in the family of origin.

***Multi-country studies.*** Only one country level study (Moniruzzaman and Andersson 2005) was identified that examined the relationship between economic development and homicide rates among children and adolescents (agegroups <1 year, 1-4 years, 5-14 years). Patterns in homicide rates varied considerably by age group and income, but there was a tendency for homicide rates to be highest in low-income countries and lowest in high-income countries.

**Intervention studies.** A meta-analytical review considered early home visitations' potential to influence child physical abuse and neglect (Guterman 1999). As part of the analysis, the author assessed whether population-based enrollment strategies were more effective than targeted ones. The review showed that population-based programmes appeared favourable to screening-based ones in early home visitation programmes. An explanation provided was that psychosocial risk screens serve to enrol higher proportions of families for which early home visitation services are less likely to leverage change, and to exacerbate a mismatch between early home visitation service and family needs.

This finding is supported by a recent meta-analysis of individual and group-based parenting programmes for the treatment of physical child abuse and neglect revealing that there is insufficient evidence to support the use of parenting programmes to treat physical abuse and neglect (Barlow et al. 2006).

### Violence towards adults

No studies examining socioeconomic disparities and the risk of violence towards adults were conducted in Europe. All come from the USA. There are no ecological studies that focus specifically on adult populations.

**Studies from outside Europe.** For the individual level analyses, a variety of populations were examined. One study (Rich and Sullivan 2001) focused only on young male primary care patients (ages 17 to 29 years). A high school education or less was significantly associated with an increased likelihood of violent assault (defined here as having been shot, stabbed, shot at, or beaten). At a Baltimore trauma centre, a study focused on repeat victims of violence found that a lack of medical insurance, low education and income were among the prominent risk factors associated with recidivism (Cooper et al. 2000). Being an African American male, unemployed, having a median age of 31 years, and involvement with drugs were other risk factors. Among postmenopausal women (aged 50-79 years at baseline), Mouton et al. (2004) found that baseline prevalence of self-reported physical abuse was associated with service occupations and having lower incomes, but not education. Only an intermediate income level was associated with new cases of abuse at a 3-year follow-up. A study in the USA found that compared to individuals with high income and those who are high school graduates, those in the two lowest income brackets and those who are not high school graduates, respectively, are at increased risk of homicide, after adjustment for covariates. No difference in risk was found between white and blue collar workers.

A multilevel study in the USA (Cubbin et al. 2000) found that neighbourhood socioeconomic status had an impact over and above the effects of individual characteristics in identifying cases of violence.

**Multi-country studies.** Only one study was identified that examined the relationship between economic development and homicide rates at the country level (Moniruzzaman and Andersson 2005). It found a negative correlation between homicide rates and GNP per capita. This association became stronger with increasing age, and was strongest among 65+ year-olds for both males and females.

### Intimate Partner Violence (IPV)

Studies on the socioeconomic patterning of IPV have been conducted primarily outside Europe in a variety of countries, in Australia, USA (5 studies), Nicaragua, Haiti, India, Bangladesh and Sri Lanka. Almost all of them were based on surveys, using more or less large samples. Some considered specific groups of women (e.g., pregnant ones). IPV was measured in various forms: physical, psychological and sexual, and with varying reference periods: current, past 12 months and life time.

**European studies.** Only three European studies have been identified and all of them concerned pregnant women: one was conducted in three Swedish cities (Hedin and Jansson 1999) and two others in Turkey (Karaoglu et al. 2006; Yanikkerem et al. 2006). In the Swedish study, various forms of violence were considered and it was observed that occupational status, but not age, income or education, was

significantly correlated with physical violence. The studies from Turkey revealed that living in an urban area, low education level of the husband, low family income and being in second trimester were the main predictors of overall violence during pregnancy (Karaoglu et al. 2006) and that, compared to non-abused pregnant women, abused ones were themselves less educated and had lower income (Yanikkerem et al. 2006).

***Studies from outside Europe.*** Among the studies from outside Europe, several were conducted in the USA. One, concerning women of reproductive age and conducted by the Centre for Disease Control and Prevention in Georgia (CDC 1998), showed that low socioeconomic status was a risk factor for IPV during the previous year. Similar results were obtained in a study encompassing eight states (Vest et al. 2002) and showing that factors consistently associated with IPV across the majority of states – and in a pooled analysis – included young age, single marital status, divorced/separated marital status, and annual household income lower than \$25,000. Even when looking specifically at sub-groups of women like Native Americans (Malcoe et al. 2004), after adjusting for age, relationship status, and household size, low socioeconomic index was still strongly associated with past-year IPV.

Not surprisingly, a number of American studies looked at the socioeconomic patterning of IPV for different race groups. One from Rhode Island (Perlman et al. 2003) concentrated on police-reported domestic violence and showed that, across all levels of neighbourhood poverty, the risk of domestic violence was higher for Hispanic and black women than among whites. Also, except for neighbourhood education (measured in terms of percentage of adults with college education) the nature and number of neighbourhood characteristics associated with IPV varied across race groups. For black women, education contributed independently to the risk of reported domestic violence. For Hispanic women, percentage of residents living in relative poverty, percentage of residents without college degrees, and percentage of households monolingual in Spanish contributed. For white women, neighbourhood-level measures of poverty, unemployment, and education were significant determinants. Another study in California (Weinbaum et al. 2001) showed that, controlling for age and race/ethnicity, a large number of factors were associated statistically with physical violence, including low income, participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and having limited access to health care. Looking at current abuse and abuse during pregnancy reported by women contacted in six postpartum maternity settings, a study (Bohn et al. 2004) showed that decreased income, not having a high school education, and ethnicity were significantly related to current abuse and abuse during pregnancy. Yet, in multivariate analyses, having less than a high school education emerged as the most significant predictor of both abuse variables.

In a study from Philadelphia that considered domestic physical violence leading to injuries as part of the intentional injuries sustained by women in general (Grisso et al. 1999), it was observed that 53% of the violent injuries to the women had been perpetrated by persons other than their partners. Neighbourhood characteristics, including low median income, a high rate of change of residence, and poor education, were independently associated with the risk of violent injuries among women.

Two studies from high-income countries took into account both male and female victimization. One was conducted in Australia (Grande et al. 2003) and observed that demographic factors such as low household income, unemployment or part-time employment had a significant relationship with domestic violence among both men and women. The other one was a multilevel study from the United States (Curadi et al. 200) and it showed that couples residing in impoverished neighbourhoods are at increased risk for both male-to-female (MFPV) and female-to-male partner domestic violence (FMPV). Also, the association between residence in an impoverished neighbourhood and MFPV was statistically significant for black couples and that with FMPV, for black and white couples.

Studies conducted in low- and middle-income countries produce fairly similar results but some that paid attention to this aspect indicate that there might be differences between women depending on whether they live in urban or rural areas.



In Nicaragua, a study on life time exposure to domestic violence (Ellsberg et al. 1999) revealed that spousal violence was significantly positively associated with poverty, parity, urban residence, and history of violence in the husband's family. No significant associations were found between spousal violence and women's age, education, marital dependency, or occupation. In Haiti, when surveying ever-married women of reproductive age (Gage 2005), a significant association was found with all forms of violence and women's lack of completion of primary school. Neighbourhood poverty and male unemployment, number of children living at home, women's attitudinal acceptance of wife beating, and male-dominated financial decision-making were additional risk factors for sexual violence. Women's economic independence was a protective factor for emotional and physical violence. In Aleppo, Syria, physical abuse among low income women was negatively correlated with their level of education (Maziak and Asfar 2003).

In India in Karmate State, when studying lifetime exposure to marital physical and sexual violence among married women (Krishnan 2005) it was observed that women belonging to lower caste, poorer households, having greater economic autonomy, and whose husbands consumed alcohol were more likely to report violence. In multivariate analyses, indicators of women's economic autonomy and husbands' alcohol consumption were significantly associated with violence, independent of caste and economic status. Similarly, in Sri Lanka in the Trincomalee District, the lifetime exposure to wife beating was linked to an early age at marriage, low-income, a low standard of living index, large families and alcohol consumption by the batterer (Subramaniam and Sivavogan 2001). There was a significant inverse relationship between domestic violence and the level of education of both the batterer and the victim.

Considering married women in six villages from Bangladesh (Bates et al. 2004) only education was associated with significantly reduced odds of violence; the odds were increased for women who had a dowry agreement or had personal earnings that contributed more than nominally to the marital household. A multi-level study from Bangladesh, where women from both rural and urban areas were surveyed, revealed for its part that whereas dowry and other demands in marriage increased the risk of violence, the husband's education beyond the tenth grade decreased the risk. In the urban area, being younger than the husband and participating in savings and credit groups increased the risk of abuse; husband's education beyond the sixth grade had a protective effect. In the rural area, women's earning an income increased the risk.

***Multi-country studies.*** In a multi-country study conducted in six urban low- and middle-income communities from Chile, Egypt, India, and the Philippines (Naved and Persson 2005), considerable variability among the communities was observed with respect to the relationship between socioeconomic indicators and current physical and psychological IPV. In general, the employment status of the woman was related to her experience of IPV, and her educational level and family's assets index were protective factors. When considered in multiple logistic regression models, the asset index was the only indicator that was consistently significant across communities.

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**Table 16.1 All ages aggregated/unspecified: area-based studies within Europe**

AUTHOR(S)	SETTING/PERIOD	GROUP	MEASURE	OUTCOME	RESULTS
Shaw et al. 2005	UK Britain; 1981- 2000	Males and females all ages	Poverty	Sex-age standardised murder rates	Increases in murder rates were concentrated in the poorest areas
Downing et al. 2003	UK West Midlands; 1999-2000	A and E attendances and admissions	Deprivation	Sex-age standardised assault	Assault is positively related to deprivation
Howe & Crilly 2001	UK Chorley; 1998- 1999	Male and female A and E attendances	Townsend Deprivation Score	Age standardised violent assault	Strong correlation between material deprivation and attendance following violent assault for men and women

**Table 16.2 All ages aggregated/unspecified: individual- and area-based studies outside Europe**

AUTHOR(S)	SETTING/PERIOD	GROUP	MEASURE	OUTCOME	RESULTS
<b>INDIVIDUAL LEVEL</b>					
Byrne et al. 1999	USA	Women assessed at 3 one-year intervals	Education, poverty	Physical assault, rape	Increased risk for new victimization when income is below poverty level. No association with education
<b>AREA LEVEL</b>					
Krieger et al. 2003	USA Massachusetts; 1995-1997	Gunshot and stab wound cases from surveillance system	Working class, education, income, poverty, wealth, 8 composite measures	Non-fatal weapons-related intentional injuries	Poverty, income, Townsend Index, Index of Local Economic Resources and education detected the steepest socioeconomic gradients. Wealth and income inequality detected lowest gradients
Kyriacou et al. 1999	USA Los Angeles; 1988-1992	Gang members	Education, income	Gang-related homicide	With mutual adjustment of all variables, only income and proportion employed were significantly associated with gang-related homicide
Wallace & Wallace 1998	USA New York; 1970, 1980, 1990	All violent death cases	Socioeconomic status (unemployment and receipt of public assistance)	Violent death incidence or density	Socioeconomic status, overcrowding and low-weight births in stepwise regressions correlated significantly with violent death incidence or density
Santos et al. 2006	Brazil Porto Alegre; 1998	Homicides	Income, education	Homicide rates	Homicide rates were lower in the two groups of areas with higher income and educational level; census tracts groups with higher homicide rates present poor SES conditions

**Table 17 Multi-country studies**

AUTHOR(S)	SETTING/PERIOD	GROUP	MEASURE	OUTCOME	RESULTS
<b>COUNTRY LEVEL</b>					
Moniruzzaman & Andersson 2005	53 countries from World Health Statistics Annual; 1996	Male and female homicides aged 0-14, 15-44, 45+	GNP per capita (as measure of economic development); 4 country groups: low, low-middle, upper-middle and high income	Homicide rates	Negative correlation between homicide rates and economic development. The association between homicide rates and country GNP per capita became stronger with increasing age. The homicide rate among females was highest for <1-year-old children in low income countries
Lester 2001	England and Wales, India, Japan, Russia, Sweden, Taiwan, Ukraine, USA	Homicides	Per capita income	Homicide rates	Positive associations of homicide rates with per capita income, divorce, suicide and unemployment rates and population size

**Table 18.1 Violence towards children and adolescents: studies within Europe**

AUTHOR(S)	SETTING/PERIOD	PLACE OF INJURY	GROUP	MEASURE	OUTCOME	RESULTS
<b>INDIVIDUAL LEVEL</b>						
Haj-Yahia & Ben-Arieh 2000	Israel	Home environment	Arab secondary school students, aged 16-18 years	Parents' levels of education, family income	Physical aggression by parents and siblings	Low parental education predictor of maternal, but not paternal or sibling, aggression towards adolescent
Bardi & Borgognini-Tarli 2001	Italy Tuscany; 1998	Home environment	Pupils from kindergartens and primary schools; ages 3-12 years	Parental education, income	Minor and severe violence	Low income, caretakers with health problems or stress, younger and more "problematic" children presented the highest risk of intrafamily violence
<b>AREA LEVEL</b>						
Khoury-Kassabri et al. 2004	Israel 1999	School environment	Students in grades 7-11	Neighbourhood income and education; students' families income, education and social deprivation index	Serious and moderate physical school violence	High levels of victimization by serious and moderate physical violence was associated with low SES of the school's neighbourhood and students' families. Higher levels of victimization were reported in overcrowded classes, while school size was not associated with students' reports of victimization

**Table 18.2 Violence towards children and adolescents: studies outside Europe**

AUTHOR(S)	SETTING/PERIOD	PLACE OF INJURY	GROUP	MEASURE	OUTCOME	RESULTS
<b>INDIVIDUAL LEVEL</b>						
Berger 2005	USA 1985	Home environment	Children in single- and two-parent families	Parents' levels of education, income-to-poverty	Physical abuse	Income significantly related to violence toward children in single-parent families, but not in two-parent families. Differences in maternal and paternal education levels associated with violence in two-parent families
Cappelleri et al. 1993	USA	Any location	Children	Family income	Sexual abuse and physical abuse	Family income, age and ethnicity were risk factors for both sexual and physical abuse. A gender-by-income interaction distinguished sexual abuse from physical abuse
Haj-Yahia & Abdo-Kaloti 2003	Palestinian Authority West Bank, East Jerusalem, Gaza Strip	Home environment	Palestinian secondary school students	Parents' levels of education, family income	Physical violence in childhood and adolescence by parents and siblings	Lower parental education and income associated with higher levels of physical violence
King et al. 2004	South Africa Cape Town; 1997	Unspecified	Male and female high school students	Socioeconomic status (based on number of household amenities)	Sexual assault	Socioeconomic status marginally significant predictor of sexual assault for males and females combined, but not separately. Family structure, suicidal behaviour, alcohol use, anti-social behaviour were predictors of sexual assault while age, drug use, smoking and race were not
<b>AREA LEVEL</b>						
Najem et al. 2004	USA New Jersey; 1989-1997	Any location	White and African-American youth aged 15-24	Education	Homicide	Homicide incidence rate correlated with low level of education and the counties' high urbanization index
Powell & Tanz 1999	USA Chicago; 1986-1996	Any location	Children aged 16 years or younger	Income, poverty	Non-fatal and fatal firearm assault	Increasing rates of fatal and non-fatal assault across areas associated with decreasing income and increasing poverty. Black and Hispanic youth living in poverty were at particular risk
<b>MULTILEVEL</b>						
Coulton et al. 1999	USA Cleveland	Home environment	Children under 18 years	Neighbourhood: structure; Individual: education, income, violence in family, time in neighbourhood, marital status, social support	Child maltreatment potential	Neighbourhood factors of impoverishment and child care burden significantly affect child abuse potential after controlling for individual risk factors

**Table 19 Multi-country studies**

AUTHOR(S)	SETTING/PERIOD	GROUP	MEASURE	OUTCOME	RESULTS
<b>COUNTRY LEVEL</b>					
Moniruzzaman & Andersson 2005	53 countries from World Health Statistics Annual; 1996	Male & female homicides aged <1, 1-4, 5-14	GNP per capita (as measure of economic development); 4 country groups: low, low-middle, upper-middle and high income	Homicide rates	No association between homicide country GNP level. No clear relationship between country income-level group and homicide

**Table 20 Violence towards adults: studies outside Europe**

AUTHOR(S)	SETTING/PERIOD	PLACE OF INJURY	GROUP	MEASURE	OUTCOME	RESULTS
<b>INDIVIDUAL LEVEL</b>						
Cooper et al. 2000	USA Baltimore; 1995-1996	Any location	Repeat victims of violence admitted to trauma centre, 18 years and older	Education, income, no medical insurance	Violent assault	Significantly more cases of violent assault have low education, low income and no medical insurance compared to controls
Cubbin et al. 2000a	USA; 1987-1994 to 1995	Any location	Males, females and combined aged 18-64	Education, income, occupation	Homicide	Low income and education levels are associated with an increased risk of homicide after adjustment for covariates. No difference in risk was found between white and blue collar workers
Mouton et al. 2004	USA	Any location	Postmenopausal women (50-79 years) from baseline and 3-year follow-up survey	Education, income, occupation	Physical abuse	Service occupations, lowest incomes and living alone are predictors of abuse at baseline but not follow-up. No association with education after adjustment for covariates
Rich & Sullivan 2001	USA	Any location	Young men (ages 17-29) during initial visits to urban primary care facility	Education	Violent assault	High school education or less, history of incarceration and having children significantly associated with increased likelihood of violent assault
<b>MULTI LEVEL</b>						
Cubbin et al. 2000b	USA; 1987-1994	Any location	All cases aged 18-64 years	Individual: education, income, occupation Census Tract: education, income, poverty occupation	Homicide	Residence in low SES neighbourhoods increases risk of homicide even after adjustment for individual variability



**Table 21 Multi-country studies**

AUTHOR(S)	SETTING/PERIOD	GROUP	MEASURE	OUTCOME	RESULTS
<b>COUNTRY LEVEL</b>					
Moniruzzaman & Andersson 2005	53 countries from World Health Statistics Annual; 1996	Male and female homicides aged 15-24, 25-44, 45-64, 64+	GNP per capita (as measure of economic development); 4 country groups: low, low-middle, upper-middle and high income	Homicide rates	Negative correlation between homicide rates & economic development. Association between homicide rates and country GNP per capita became stronger with increasing age, strongest for 65+ years for both males and females

**Table 22.1 Intimate Partner Violence: studies within Europe**

AUTHOR(S)	SETTING/PERIOD	GROUP	MEASURE	OUTCOME	RESULTS
<b>INDIVIDUAL LEVEL</b>					
Hedin & Janson 1999	Sweden Antenatal clinics in Gotenberg and Stockholm	Pregnant women – Swedish born married to or cohabiting with Swedish born men	Socio-demographic variables	Severity of Violence Against Women Scale (SVAW); Psychological Maltreatment of Women Inventory (PMWI)	Occupational status, but not age, income or education, was significantly correlated to physical violence, dominance/isolation and to emotional/verbal factor
Karaoglu et al. 2006	Turkey Malatya province	Pregnant women	Socio-demographic variables	Physical, emotional and sexual violence during pregnancy	Living in urban area, low education level of husband, low family income and being in second trimester were the main predictors of overall violence during pregnancy
Yanikkerem et al. 2006	Turkey Manisa city 2 socioeconomic areas (urban and rural)	Pregnant women	Socio-demographic variables	Physical violence during and before pregnancy; forced sexual activity	Abused pregnant women were e.g., less educated, had lower income, were unmarried, were multiparous, had more children, had a longer duration of marriage, lived in rural areas, when compared with non-abused women

**Table 22.2 Intimate Partner Violence: individual-based studies outside Europe**

AUTHOR(S)	SETTING/PERIOD	GROUP	MEASURE	OUTCOME	RESULTS
<b>INDIVIDUAL LEVEL</b>					
CDCs 1998	USA Georgia	Women of reproductive age	Women SES	Lifetime and annual incidence	Low socioeconomic status is a risk factor for IPV during the previous year
Vest et al. 2002	USA 8 states	Women	Socio-demographics	IPV	Factors consistently associated with IPV across the majority of states and in the pooled analysis included young age, single marital status, divorced/separated marital status, and annual household income <\$25,000
Malcoe et al. 2004	USA	Native American women	Socioeconomic index – partner's education, public assistance receipt, poverty level	Lifetime and past-year IPV	After adjusting for age, relationship status, and household size, low socioeconomic index still strongly associated with past-year IPV
Pearlman et al. 2003	USA Rhode Island	Women	Stratification by age and race (black, white, Hispanic) Individual data and data on neighbourhood conditions (unemployment, education, income, poverty, monolingual household)	Police reported domestic violence	Across all levels of neighbourhood poverty, the risk of domestic violence was higher for Hispanic and black women. Results from the linear regression models varied by race. For black women, living in a census block group in which fewer than 10% of adults ages > or = 25 years were college-educated contributed independently to risk of police-reported domestic violence. For Hispanic women, three neighbourhood-level measures were significant: percentage of residents living in relative poverty, percentage of residents without college degrees, and percentage of households monolingual in Spanish. A higher degree of linguistic isolation decreased risk among the most isolated block groups for Hispanic women. For white women, neighbourhood-level measures of poverty, unemployment, and education were significant determinants
Weinbaum et al. 2001	USA California	Women 18yrs +	Socio-demographic variables	IPV – physical violence (PV)	Controlling for age and race/ethnicity suggest that a large number of factors are associated statistically with IPV-PV victims e.g., feelings of ill physical and mental health; pregnancies at early age; nutritional needs; low income; participation in the Special Supplemental Nutrition Program for Women, Infants, and Children; having children aged < 18 in the household; and limited access to health care
Bohn et al. 2004	USA 6 postpartum maternity settings	Before/during pregnancy	Women SES, education, ethnicity and age	Current abuse, abuse during pregnancy	Decreased income, not having a high school education, and ethnicity were significantly related to current abuse and abuse during pregnancy; having less than a high school education emerged as the most significant predictor of both abuse variables in multivariate analyses
Grisson et al. 1999	USA Philadelphia	Adolescent girls and women	Individual and neighbourhood characteristics	Intentional injuries	Fifty-three percent of violent injuries to the women had been perpetrated by persons other than their partners. Women's use of illicit drugs and alcohol abuse were associated with violence on the part of partners and on that of other persons. Neighbourhood characteristics, including low median income, a high rate of change of residence, and poor education, were independently associated with the risk of violent injuries among women

Grande et al. 2003	Australia	Male and female adults 18 yr.+	Various individual and household variables	Various forms of domestic violence by current or ex-partner	Demographic factors such as low household income, unemployment or part-time employment had a significant relationship with domestic violence
Maziak & Asfar 2003	Syria Aleppo	Low-income women at primary care centres	Education	Physical abuse	Correlates of physical abuse were women's education
Ellsberg et al. 1999	Nicaragua Leon	Women of reproductive age	Women and husband SES	Lifetime	Spousal violence was significantly positively associated with poverty, parity, urban residence, and history of violence in the husband's family. No significant associations were found between spousal violence and women's age, education, marital dependency, or occupation
Gage 2005	Haiti	Ever-married women of reproductive age	Various SES variables, e.g. education, income, Neighbourhood poverty	Emotional, physical and sexual, multiple forms – past 12 months	Significant positive associations with all forms of violence for lack of completion of primary school. Neighbourhood poverty and male unemployment, number of children living at home, women's attitudinal acceptance of wife beating, and male-dominated financial decision-making were additional risk factors for sexual violence. Women's economic independence was a protective factor for emotional and physical violence
Krishman 2005	India Karnata State; rural communities	Married women	Structural inequalities in the couple	Marital violence ever – e.g. physical and sexual	Women belonging to lower caste, poorer households, having greater economic autonomy, and whose husbands consumed alcohol were more likely to report violence. In multivariate analyses, indicators of women's economic autonomy and husbands' alcohol consumption were significantly associated with violence, independent of caste and economic status
Bates et al. 2004	Bangladesh 6 villages	Married women	Women education, income, dowry	Past year experience	Only education was associated with significantly reduced odds of violence; the odds were increased for women who had a dowry agreement or had personal earnings that contributed more than nominally to the marital household
Subramaniam & Sivavogan 2001	Sri Lanka Tricomalee District	Women aged 18-49 yrs	Socio-demographic variables – women/men	Wife beating – Life time and past year	Wife beating was associated with an early age at marriage for women, low-income, a low standard of living index, large families and alcohol consumption by the batterer. There was also a significant inverse relationship between domestic violence and the level of education of both the batterer and the victim
<b>MULTILEVEL</b>					
Naved & Persson 2005	Bangladesh Urban and rural area	Women of reproductive age	Individual: wife and husband socio-demographics Neighbourhood variables	Physical violence	Dowry/other demands in marriage increased the risk of violence. Husband's education beyond the tenth grade decreased the risk. In the urban area, being younger than husband and participating in savings and credit groups increased the risk of abuse; husband's education beyond the sixth grade had a protective effect. In the rural area, women's earning an income increased the risk
Cunradi et al. 2000	USA National sample	Women and men	Stratification by race Individual: socio-demographic Neighbourhood: census tract poverty level	Male-to-female partner violence (MFPV) and female-to-male partner violence (FMPV)	Couples residing in impoverished neighbourhoods are at increased risk for both MFPV and FMPV. The association between residence in an impoverished neighbourhood and MFPV was statistically significant for black couples; and that with FMPV for black and white couples

**Table 22 Multi-country studies**

AUTHOR(S)	SETTING/PERIOD	GROUP	MEASURE	OUTCOME	RESULTS
<b>COUNTRY LEVEL</b>					
Bangdiwala et al. 2004	Chile, Egypt, India, the Philippines 6 urban low and middle income communities	Women 15-49 years	Family asset index, current work status of the woman and husband/partner, years of formal schooling completed by the woman and husband/partner	Current (past 12-months) physical and violence and IPV	There were considerable variability among the six sampled communities with respect to the relationship between socioeconomic indicators and current physical and psychological IPV. In general, the employment status of the woman was related to her experience of intimate partner violence, and her educational level and family's assets index were protective factors. When considered in multiple logistic regression models, the asset index was the only indicator that was consistently significant across communities.

## Chapter 6: all causes or specific sites or body parts

### Summary of findings

Studies that examine all injury causes or focus on specific sites or body parts, more often include children and adolescents than other age groups. Several are from European countries, but they are biased to the northern part of Europe, with some exceptions. Altogether, the evidence at hand shows that SES is in many instances an important injury determinant. The strength of the association – or of the effect – depends on the indicator of deprivation, the injury severity level and its cause or outcome. The more severe the injury, the stronger the association is. There are cases of inverted relationships, in particular for sports and recreational injuries. Multilevel studies indicate, not surprisingly, that both individual and contextual mechanisms come into play to explain the association between material deprivation and injury. There are no interventions evaluated from the point of view of the social patterning of their outcome in this group of studies.

Mortality studies		
Total number of studies	16	
Europe	8	Czech Republic, Lithuania, Scotland, Spain, United Kingdom
Outside Europe	6	Canada, USA
Multi-country	2	54 countries
All ages / Adulthood	8	
Childhood/youth	8	
Morbidity studies*		
Total number of studies	39	
Europe	22	England, Finland, Ireland, Sweden, United Kingdom
Outside Europe	17	Australia, Brazil, Canada, China, USA
Multi-country	1	51 countries; 8 countries with data on injury
All ages / adulthood	10	
Childhood/youth	29	

\* Some studies dealt with both injury mortality and morbidity and they are counted twice.

The studies included herein are organised in two main sections representing two different age groupings: childhood and adolescent injuries, the largest group, and injuries all ages aggregated or among adults.

### Children and adolescents

Studies on children and adolescents have been conducted almost exclusively in North America (USA and Canada) and in the north of Europe (United Kingdom, Ireland and Scotland, Sweden, Finland). Their designs are both individual-based and area-based and they seek to assess the extent to which various socioeconomic descriptors are related to the occurrence of injuries in general, considering various severity levels. A number of studies look at those associations all causes of injuries aggregated and then by specific cause. Several studies look at specific injury outcomes like traumatic brain injuries or dental injuries, and a few focus on recreational injuries. Most studies are register-based but some surveys have also been conducted. Sex-specific analyses are not very common.

**European studies.** Studies conducted in European countries at the individual level show an association between family-related socioeconomic status and mortality in infants (*Czech Republic*; Bobak et al. 2000) and dental injury among adolescents 14-years-old (*Newham, London*; Marcenes and Murray 2001). A Swedish national study including four age groups of children and adolescents paid attention to the distribution across five household socioeconomic groups of various causes of injuries, both intentional and unintentional, while merging fatal ones and those necessitating hospitalisation. While no significant association was found for fall injuries, whatever the age group, strong ones were observed for traffic-related (in particular among older teenagers), violence-related and self-inflicted injuries (Engström et al. 2000; 2002). In a Finnish national survey where injuries requiring medical attention among teenagers aged 12, 14, 16 and 18 were considered, no association was found with parents' occupation, education or employment status.

For their part, the studies conducted at the area level fairly consistently show an association between deprivation of the living area and injuries of various kinds and severity. Most of them are from the United Kingdom. Among these, one examines femoral fractures (Bridgman et al. 2004), another one mortality from head injuries among the 0 to 14 year olds (Williamson et al. 2002), another one traumatic brain injuries but not only fatal ones (Hawley et al. 2003), two look into hospitalisation for the same age group (Hippisley-Cox et al. 2002; Lyons et al. 2003) and three examine emergency department attendance (Brown et al. 2002; Silversides et al. 2005; Haynes et al. 2003). Two studies that pay attention to various severity levels show that the association between material deprivation and injury is stronger when the injury is more severe (Hippisley-Cox et al. 2002; Kendrick and Marsh 2001). Even when specifically analysing injuries from school injury reports, an excess risk is found among schools from more deprived wards (Latif et al. 2002).

It ought to be underlined that, in a study on injuries among children aged 3 months to 3 years, it was also noticed that more than half of those children residing in a deprived ward did not have a medically attended injury and more than 90% did not have a hospital admission. On the other hand, 60% of children who had a medically attended injury and 40% who had a hospital admission did not live in a deprived ward (Kendrick and Marsh 2001).

Some studies stratified by various causes/mechanisms (Hippisley-Cox et al. 2002; Lyons et al. 2003; Silversides et al. 2005) and found that the association with deprivation was stronger for many causes the more severe the injury. Yet, when attention was paid to the age and sex of the child and when smaller sub-groups of causes were considered (e.g., within traffic or within falls), not only "aggravating" but also "protective" effects of deprivation are observed (Reimers and Laflamme 2005; 2004).

A multi-level study from Norwich (*UK*; Reading et al. 1999) on preschool injuries found that much of the variation in injury rates was accounted for by factors at the individual level (i.e., male sex, young maternal age, number of elder siblings and distance from hospital), with a smaller, but independent, influence of living in a deprived neighbourhood. The model for more severe injuries was similar except single parenthood was then significant at the level of individuals and the effect of area deprivation was stronger. The authors concluded that preschool injuries are influenced by factors operating at both the level of individual families and between areas.

**Studies from outside Europe.** Individual-based studies from outside Europe also consider various severity levels and some specific diagnoses such as recreational (*USA*; Ni et al. 2002; Potter et al. 2005) or dental injuries (*Brazil*; Marcenes et al. 2001; Nicolau et al. 2001). As a whole, with some exceptions (Chen et al. 2005) the studies do not strongly support the idea of an association between socioeconomic status of the household or socioeconomic circumstances and injuries. Some cases of inverted relationships are noted for dental injuries among children 12 years old (Marcenes et al. 2001) and recreational ones among adolescents 12-19 years (*Canada*; Potter et al. 2005). Differences in both magnitude and in nature of injuries were observed among children 6-17 years (*USA*; Ni et al. 2002).

Area-based studies, apart from one on sports-related injuries in Australia (Lam 2005), are much more

strongly supportive of the association between material deprivation and injuries. Several of them considered fatal injuries or a combination of severe and fatal injuries (*USA*; Durkin et al. 1998; Pomerantz et al. 2001; *Canada*; Brownell et al. 2000). Various diagnoses/settings (Faelker et al. 2000; Durkin et al. 1998; Durkin et al. 1998) and even severity levels (Marcin et al. 2003; Brownell et al. 2000) were considered.

The one multi-level study identified is based on a survey and considered Canadian adolescents from grades 6-10 and their medically treated injuries and hospitalisations. It yielded mixed results. In general, lower SES was associated with increased risk for hospitalised and fighting injury, and higher SES with increased risk for sport/recreational injury. No associations were identified for medically treated injuries.

**Multi-country studies.** There was also one multi-country study including 8 countries with survey data collected on adolescent health behaviour and data on medically attended adolescent injuries, split into type and location. It revealed that high material wealth of the household was positively associated with (all) injuries and sports-related injuries and that poverty was positively associated with fighting. In another study, countries were compared for their GNP per capita and grouped in different ways in order to investigate the association between GNP and unintentional injury mortality among the young (1-14 years) (Plitponkarnpim et al. 1999). It found that unintentional injury mortality in childhood was often negatively correlated with GNP; a high percentage of total injury deaths was clearest in the lower middle-income countries in all age and gender groups.

#### All ages aggregated and adults only

Studies in this group are fewer and have been conducted more often in European countries than outside Europe. They come from Lithuania, Sweden, Spain, Russia and the United Kingdom. All but one study from outside Europe are from the USA. Again, various socioeconomic measures and injury severity levels are covered. They are all register-based.

**European studies.** Studies conducted in the European countries at the individual level come from Lithuania (Tamosiunas et al. 2005), Russia (Plavinski et al. 2006), Sweden (Eilert-Petersson and Laflamme 2001; Laflamme and Eilert-Petersson 2001) and Scotland (Macloed and Andrews 2002). Both the Lithuania and Russian studies deal with injury mortality; while the former is national, the latter is undertaken in one city (Saint Petersburg). The study from Scotland focuses on acute brain disorders and includes both mortality and morbidity data, and the two studies from Sweden cover a single municipality and are based on accident and emergency data.

In the study from Lithuania, injury mortality was not associated with material deprivation as strongly for the various measures of SES considered: a negative association was found with education level and no association with family status and occupation. In the Russian study, the association between social factors and the sharp increase of injury mortality in the 1990s in Saint Petersburg was assessed. Men in the lower socioeconomic groups (particularly with low education) are those most affected by the mortality increase. Surprisingly, there was no increase in the rate of unintentional or violent deaths.

In the Swedish studies, men and women were considered separately and so too were different product categories and settings (e.g., home, work, transport). In one study, it was observed that males and females from lower SES had higher injury rates in all categories of products except sports-related ones and the role of products for social patterning changed with age (Eilert-Petersson and Laflamme 2001). In the other study, men from lower SES had an excess risk of injuries in all settings except sports; and women, in home settings and transport areas (Laflamme and Eilert-Petersson 2001). In the study from Scotland, deprivation was associated with higher rates of hospital admission and death but with lower rates of admission to the intensive care unit (Macloed and Andrews 2002).

There are three area-based studies and two multi-level ones. One of the former is a Swedish “all ages” municipality-based study where various causes of injuries were studied (all, traffic and other unintentional

injuries) and where no remarkable and significant differences between areas were found. Another one is from Wales (Lyons et al. 2003) that paid attention to injuries even among the elderly as a group (one of the very few). It highlighted that the ratio of admissions in deprived and affluent areas varied with the category of injury. Socioeconomic variations were much smaller in older people with the exception of pedestrian-related injuries where the rates were similar to those for children. A more recent study covering the whole of England focused on hospital admission following head injury (Tennant 2005). In this study, head injury incidence was determined and cluster analysis and multiple regression analysis were used to look at patterns and associations. Head injury incidence varied considerably across regions and three clusters were identified: those typical of London, those of the shire counties, and those of other urban authorities. Socioeconomic factors were found to account for a high proportion of the variance in incidence. The use of public transport for travel to work is associated with a decreased incidence of head injuries while lifestyle indicators, such as the numbers of young unemployed, increase the incidence.

The two multi-level studies are for sexes aggregated in Spain. Both paid attention to various injury causes but considered different severity levels: mortality (Borrell et al. 2002) and accident and emergency data (Ferrando et al. 2005). Education is used at the individual level and percentage of unemployed at the area level (even percentage of men in jail in one study). The one study based on mortality (Borrell et al. 2002) found that educational level followed a gradient with higher risks for no schooling (after adjustment) and some socioeconomic inequalities were more important in the young (20-34 years). The contextual effect of deprivation remained after adjustment. The study based on accident and emergency data showed that, after adjustment, for all three causes studied (motor vehicle crashes, falls, hits/cuts) rates were higher for lower educational level (individual, after adjustment) and higher percentage of unemployment (contextual), indicating that both individual and contextual mechanisms came into play.

***Studies from outside Europe.*** All studies but one from outside Europe were conducted in the USA. Two of them are large scale and based on individual data. One of these considered injury death and injury morbidity together and split by cause, both sexes aggregated and for different measures of SES (Cubbin et al. 2000a). It appeared that SES was an important injury determinant and that its effect depended on the indicator chosen, on injury cause and on injury severity. The other study considered mortality for different causes of injury among people aged 20-64 years from 27 states (Steenland et al. 2003). Men's SES was strongly associated with mortality from all causes combined, which was less obvious for women. The pattern was similar when specific causes were analysed (motor vehicle, suicide, homicide, medical complications).

There is also one study based on individual data that comes from rural Vietnam (Yhan et al. 2005) showing that poverty is a risk factor for unintentional injuries generally, and in particular for home and work injuries. It has a protective effect for school injuries but does not affect the social patterning of traffic injuries.

There is also one area-based and one multi-level study among the studies from the USA. The area-based study is from San Diego (California) and is concerned with serious brain injuries (Kraus et al. 1986). It showed that low income tracts had higher incidence rates (adjusted).

Finally, the study mentioned above where people aged 18-64 for the whole of the USA were considered (Cubbin et al. 2000b), was designed as a multilevel study and, besides the individual effects mentioned above, it also showed that neighbourhood characteristics had independent effects on the mortality outcome (various causes) even after adjustment for individual variability, e.g., low neighbourhood SES.

***Multi-country studies.*** There was also one multi-country study where countries were compared for their GNP per capita and grouped in different ways in order to investigate the association between GNP and unintentional injury mortality all ages aggregated (Ahmed and Andersson 2000). It was found that unintentional injury mortality was inversely correlated with GNP per capita and the relationship became stronger with increasing age.



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**Table 24. Childhood and adolescence: studies *within* Europe**

AUTHOR(S)	SETTING/PERIOD	AGE GROUP	SEX	MEASURE	OUTCOME	RESULTS
<b>INDIVIDUAL LEVEL</b>						
Bobak et al. 2000	Czech Republic Whole country 1989-1992	Infant	Aggregated	Maternal socioeconomic characteristic	Mortality from injuries (73% from suffocation)	Risk of death declined with increasing maternal education
Engström et al. 2002	Sweden Whole country 1990-1994	0-19 years 0-4, 5-9, 10-14, 15-19	Aggregated	Socioeconomic status (4 groups)	Hospitalisation and fatality; Fall, traffic, violence and self-inflicted injuries	No difference for falls; highest relative differences in the 14-19 yrs, to the detriment of lower SES for both categories of intentional injuries; differences also high for traffic for the 15-19 yrs
Engström et al. 2002	Sweden Whole country 1990-1994	Three age cohorts (5-19) over a 5 year period	Separated	Socioeconomic status (4 groups)	Hospitalisation and fatality; Traffic, violence and self inflicted injuries	Little evidence of equalisation of socioeconomic differences over time
Marcenes & Murray 2001	England Newham, London 1998-1999	14-year-old	Aggregated	Proxy: postcode deprivation/over-crowding (Jarman index)	Dental injury	Living in an overcrowded household increased the risk of having a dental injury
Mattila 2004	Finland Whole country 1999	12, 14, 16, 18 years	Aggregated and separated	Parents' occupation, and education and employment status	Injury requiring medical attention (self-report)	Parents' occupation, education and employment status were not associated with injuries
<b>AREA LEVEL</b>						
Reimers & Laflamme 2005	Sweden Stockholm County 1999-2001	0-15 years	Aggregated	Parish level, 3 indices: deprivation, SES and social integration	Injuries leading to hospitalisation split into 12 injury causes	Deprivation negatively influenced pedestrian injuries, had a protective effect on other traffic injuries; Higher concentration of people with low SES increased the risk of burn and poisoning
Reimers & Laflamme 2004	Sweden Stockholm Metropolitan 2000-2002	10-19 years	Boys and girls separately	Parish level, 3 indices (material deprivation, SES and multi-ethnicity)	Injuries leading to hospitalisation split into 5 causes for boys and 3 for girls	Indexes had both aggravating and protective, depending on child sex and injury cause
Silversides et al. 2005	Ireland Belfast North and West 2001	0-12 years	Aggregated	Area deprivation most vs. least deprived areas	Emergency department attendance – all injuries and by cause	Strong association between economic deprivation and injury rate, particularly for injuries outside the home (i.e., RTI), and burn/scalds and high falls.
Haynes et al. 2003	United Kingdom City of Norwich	5-14 years Aggregated and categories	Aggregated and separated	Deprivation of the electoral ward (Townsend index) Adjusted for various parameters	Injury treated at A&E department	Injury rates were related to social area deprivation, although variations in injury rates between neighbourhoods were not wholly explained by deprivation. The adjusted odds

AUTHOR(S)	SETTING/PERIOD	AGE GROUP	SEX	MEASURE	OUTCOME	RESULTS
						ratio between the most and least deprived social areas was 1.35.
Hippisley-Cox et al. 2002	United Kingdom Trent 1992-1997	0-14 years split into 0-4 / 5-14	Aggregated	Deprivation of the electoral ward (Townsend index) Adjusted for various parameters	Hospital admissions – different severity levels (e.g., long bone fracture and operation) and mechanisms (6)	Admission for injury and for injuries of high severity increase with socioeconomic deprivation; gradients are more marked for the 0-4 yr than 5-14 yr. Mechanisms with steepest gradients: pedestrian injuries, burns and scalds, and poisoning
Latif et al. 2002	United Kingdom Wales 1996-1998	School age children	Aggregated	Wards deprivation	Injuries in school registers	Injury report rates in schools from deprived wards 3x higher than those in schools from more affluent wards
Lyons et al. 2003	United Kingdom Wales 1997-1999	0-14 years	Aggregated	Electoral tracts deprivation – 5 quintiles	Hospital admission, split into causes (e.g., pedestrian, burn, fall)	Socioeconomic variation in injury rates, to the detriment of the more deprived wards for most diagnoses studies.
Kendrick & Marsh 200	United Kingdom Nottingham 1995	3 months – 3 years	Aggregated	Electoral ward deprivation, car access,	Various severity: medically attended unintentional injuries; hospital admissions	Residence in a deprived ward, no car access were associated with at least one medically attended injury; residence in a deprived ward and young maternal age, with hospital admission
Williamson et al. 2002	Scotland/UK Whole country 1986-1995	0-14 years in groups (0-9, 10-14 y)	Aggregated and separated	Electoral tracts deprivation index in 3 levels	Head injury mortality	Children residing in relatively less affluent areas had the highest head injury mortality rates, consistent across age groups – for each study periods
Hawley et al. 2002	UK North Staffordshire 1992+	0-14 years	Aggregated	Electoral tracts deprivation	Traumatic brain injury (TBI) requiring hospitalisation	TBI is most prevalent amongst children from families living in more deprived areas. Social deprivation is not related to the cause of injury.
<b>MULTI-LEVEL</b>						
Reading et al. 1999	United Kingdom Norwich 1993-1995	Preschool children	Aggregated	Family Census enumeration districts: deprivation	A&E attendance unintentional injuries	Injury rates much higher in deprived urban neighbourhoods than in affluent areas. Much of the variation in rates was accounted for by factors at the individual level i.e. male sex, young maternal age, number of elder siblings and distance from hospital, with a smaller, but independent, influence of living in a deprived neighbourhood. The model for more severe injuries was quite similar.

**Table 25. Childhood and adolescence: studies *outside* Europe**

AUTHOR(S)	SETTING/PERIOD	AGE GROUP	SEX	MEASURE	OUTCOME	RESULTS
<b>INDIVIDUAL LEVEL</b>						
Chen et al. 2005	China Guangxi February 2002 to January 2003	Students	Aggregated	Characteristics of child, family income level	Nonfatal injuries	Gender, age, ethnicity, and family income levels were identified as significant risk factors for injury in multivariate analyses
Soubhi et al. 2004	Canada Whole country	Children and youth	Aggregated	Characteristics of child, family and neighbourhood	Medically attended injuries	Small neighbourhood effect among aggressive children 2-3 years old
Potter et al. 2005	Canada	12-19 years	Boy and girls separately	Five SES measures: household income, 2 neighbourhood-level proxy measures, 2 parental indicators	Total, recreation and non- recreation injuries	Some – but not all – sex-specific indicators of SES are associated with recreation injuries and total injuries – but not non-recreational
Ni et al. 2002	USA Whole country	6-17 years	Aggregated	Family income, ethnicity	Non-fatal recreational injuries receiving medical attention (survey)	Increased risk with higher family income (adjusted). For children from not poor families, most injury episodes occurred in sport facilities; for children from poor / near poor families, most occurred outside the home.
Marcenes et al. 2001	Brazil Blumenau	12 years	Aggregated	Mother / father education level, employment status; family income	Injuries to the permanent incisors	Children from mothers with high schooling experienced more dental injuries than those from mothers with low schooling
Nicolau et al. 2001	Brazil Cianorte	13 years	Aggregated	Mother / father education level, employment status; family income	Injuries to the permanent incisors; Traumatic dental injuries	No relationship between socioeconomic indicators and dental injuries
<b>AREA LEVEL</b>						
Marcin et al. 2003	USA California Sacramento County 10 years	0-18 years	Aggregated	Median household income; proportion of household in poverty, insurance	Trauma hospitalisation; Trauma mechanism, trauma severity, standardized hospital mortality	Children from lower SES community had higher injury hospitalization and mortality rates and presented more frequently with more lethal mechanisms of injury (pedestrian and firearm) but did not have severity-adjusted mortality
Pomerantz et al. 2001	USA Ohio / Hamilton County 1993-1995	< 15 years	Aggregated	Census tract (median income, level of education, % < poverty level, % unemployed, % families headed by females)	Injury hospitalization or death	% people living below poverty level, % did not graduate from high school, % unemployment were significant risk factors for injury

AUTHOR(S)	SETTING/PERIOD	AGE GROUP	SEX	MEASURE	OUTCOME	RESULTS
Faelker et al. 2000	Canada Ontario (province) 1996	0-19 years in categories	Boys and girls separately	% people living below poverty line at census tract level	Emergency services divided in types e.g., (home, recreational, fall injuries) and severity level (minor and moderately severe)	Consistent relation between poverty and injury; both within age and sex strata and for minor and moderate injuries
Brownell et al. 2002	Canada Manitoba province 1994-1997	0-19 years	Aggregated	Area income level	Premature mortality rate; injury hospitalisation	Both types of injury higher rates were associated with lower incomes (correlation)
Durkin et al. 1994	USA New York NY Northern Manhattan 1983-1991	0-15 years	Aggregated	Census tract proportions of low-income households, single- parent families, non-high school graduates, and unemployment	Injury resulting in hospitalisation or death head, spinal cord and peripheral nerve injuries	All indicators were significant predictors of risk for both unintentional and intentional injuries Low income was the single most important predictor of all injuries
Durkin et al. 1998	USA Northern Manhattan 1983-1992	0-15 years	Aggregated and separated	Neighbourhood income level	Death and hospital admissions – head, spinal cord, peripheral nerve injuries	Residence in a low income neighbourhood was associated with an increased risk of injury
Lam 2005	Australia New South Wales 1996-2000	5-19 years	Aggregated and separated	Residential location: socioeconomic level	Hospitalisation for sports related injury	No association found between SES and hospitalisation
<b>MULTILEVEL</b>						
Simpson et al. 2005	Canada Whole country	Adolescents, students in 6-10 grade	Aggregated and separated	Individual: family affluence and SES; Area: education, income, lone parents	Medically treated injuries, hospitalisation, sport/ recreational; fighting	In general, lower SES was associated with increased risk for hospitalised and fighting injury. Higher SES with increased risk for sport/recreational injury. Associations were not identified for medically treated injuries

**Table 26. Multi-country studies**

AUTHOR(S)	SETTING/PERIOD	AGE GROUP	SEX	MEASURE	OUTCOME	RESULTS
<b>INDIVIDUAL LEVEL</b>						
Pickett et al. 2005	8 countries with data on injuries	Adolescents	Aggregated	Individual SES (material wealth, poverty)	Medically attended injuries by types and location	6/8 countries - High material wealth was positively associated with (all) injuries and sports-related injuries. Poverty was positively associated with fighting
Plitponkarnpim et al. 1999	51 countries	1-14 yrs in categories	Aggregated and separated	GNP per capita (for socioeconomic development; 4 groups)	Total injury mortality, Unintentional injury mortality (UIM)	UIM in childhood were often negatively correlated with GNP; a high percentage of total injury deaths was clearest in the lower middle income countries in all age and gender groups

**Table 27. All ages or adults only: studies within Europe**

AUTHOR(S)	SETTING/PERIOD	AGE GROUP	SEX	MEASURE	OUTCOME	RESULTS
<b>INDIVIDUAL LEVEL</b>						
Tamosiunas et al. 2005	Lithuania Whole country 1971-2000	45-59 years	Males	Various e.g., education level, occupation, family status	Death – external causes	The risk of mortality for external causes was negatively related to education level; no association with family status and occupation
Plavinski et al. 2003	Saint Petersburg 1990s	40-59 years	Males	Education	Death – various causes	Low educated men are those most affected by the mortality increase but there were no increase for them in the rate of unintentional or violent deaths.
Eilert-Petersson & Laflamme 2001	Sweden Västmanland municipality 1989-1990	0-64 years	Separated	Socioeconomic groups (5)	Medically attended injuries, related to manufactured products – 5 categories	Males and females from lower SES tend to report higher injury rates in all categories of products except sports-related ones. The role of products for social patterning changed with age.
Laflamme & Eilert-Petersson 2001	Sweden Västmanland municipality 1989-1990	20-64 years	Separated	Socioeconomic groups (4)	Medically attended injuries – 5 settings (e.g., home, work, transport)	Men from lower SES had an excess risk of injuries in all settings except sports; females for their part, in home settings and transport areas
Macloed & Andrews 2002	Scotland Whole country 1995-1999	> 15 years	Aggregated and separately	Proxy: deprivation in area of residence	Mortality and hospital and ICU discharge for acute brain disorders, of which TBIs	Deprivation was associated with higher rates of hospital admission and death but with lower rates of ICU admission
<b>AREA LEVEL</b>						
Engström et al. 2002	Sweden Linköping municipality 1992-1996	All ages	Males and females separately	Parish: % unemployed, % low educated, % born outside Sweden	In- and outpatient ; 3 causes: all injuries, traffic injuries, other unintentional	No remarkable and significant differences between areas of various kinds
Tennant 2005	England Whole country 2001/02; 2002/03	All ages and categories 0-15, 16-74, 75+	Aggregated	Census tract Townsend index and 15 variables	Hospital admission following head injury	Socioeconomic factors account for a high proportion of injury incidence
Lyons et al. 2003	Wales Welsh 1997-1999	0-14, 15-75, 75+ years	Aggregated	Electoral tract: deprivation quintiles	Hospital admission, split into causes (e.g. pedestrian, violence, self-infliction)	Socioeconomic variation to the detriment of the more deprived wards. Largest for assaults and self-infliction. Variation with category of injury and age group.
<b>MULTI-LEVEL</b>						
Borrell et al. 2002	Spain Barcelona 1992-1998	> 19 years Age groups (e.g., 20-34, 35-44, 75+)	Females and males Separated	Individual: education Neighbourhood: % men unemployed, % men in jail	Mortality; All and by cause: Traffic, fall, drug overdose, suicide, others	Educational level followed a gradient with higher risks for no schooling (after adjustment); some inequalities more important in the young (20-34 y); contextual effect of deprivation (after adjustment)
Ferrando et al. 2005	Spain Barcelona 1990-1991	19 years + (categories)	Separated	Individual: educational level Area of residence: % unemployment	A&E department injury: motor vehicle, falls, hits and cuts	Morbidity rates for all 3 causes higher for lower educational level (individual, after adjustment) and higher % unemployment (contextual)



**Table 28. All ages or adults only: studies outside Europe**

AUTHOR(S)	SETTING/PERIOD	AGE GROUP	SEX	MEASURE	OUTCOME	RESULTS
<b>INDIVIDUAL LEVEL</b>						
Cubbin et al. 2000a	USA Whole country 1987-1994	18-64 years	Aggregated	Individual SES (e.g., occupation, education)	Injury deaths and injury morbidity - total and by cause	SES is an important injury determinant; the effects depend on indicator of SES, injury cause and injury severity
Steenland et al. 2003	USA 27 states 1984-1997	20-64 years (employed)	Separated	Occupation / SES	Mortality for external causes (e.g., motor vehicle, suicide, homicide)	SES strongly associated with mortality from all causes combined for men, to a lesser extent for women; similar pattern for each of the specific cause
Than et al. 2005	Vietnam Rural area 2000	All ages	Aggregated and separated	Household poverty (income)	Unintentional injury morbidity (survey)	Poverty is a risk factor for unintentional injuries generally, in particular home, work and "other"; protective for school injuries, not affecting traffic injuries
<b>AREA LEVEL</b>						
Kraus et al. 1986	USA California state San Diego 1982	All ages	Aggregated	Census tract: median family income	Serious brain injuries	Low income tracts had a higher incidence rates (adjusted)
<b>MULTI LEVEL</b>						
Cubbin et al. 2000b	USA Whole country 1987-1994	18-64	Aggregated	Census tract: SES, racial concentration, residential stability, urbanisation and family structure	Fatality: Homicide, suicide, motor vehicle, other external causes	Neighbourhood characteristics had independent effects on the outcome even after adjustment for individual variability, e.g., low neighbourhood SES and homicide

**Table 29. Multi-country studies**

AUTHOR(S)	SETTING/PERIOD	AGE GROUP	SEX	MEASURE	OUTCOME	RESULTS
<b>COUNTRY LEVEL</b>						
Ahmed & Andersson 2000	54 countries	All ages (categories)	Aggregated	GNP per capita (for socioeconomic development)	Unintentional injury mortality (UIM)	UIM were inversely correlated with GNP per capita and the relationship became stronger with increasing age



## Chapter 7: the Review in Brief – what do we know now?

This review was embarked upon so as to provide an overview of the knowledge accumulated so far with regards to the association between socioeconomic differences and both the occurrence of injuries and the benefits of prevention. Peer-reviewed articles published in various languages since 1990 were reviewed and classified according to the injury mechanism(s) they addressed (five main categories), their region of origin (in or outside WHO-Europe) and their observation level (individual-based, area-based/ecological, and multilevel). The process was as inclusive as possible with any study including denominators and testing for significance or providing confidence intervals being dealt with regardless of the strength of its design and effort made to control for confounding factors.

For each study reviewed and classified according to the above, the setting (place and time period), population (age and sex), measures (socioeconomic status and injury outcome) and main results were gathered. This information was tabulated and summarised in text. As the total number of studies reviewed reached about 300 and most studies were essentially descriptive and of weak design, attention was paid primarily to the direction of the association(s) or trend(s) observed rather than to their magnitude. Qualitative assessments of each individual study's design(s) are not reported.

### Originality, strengths and contribution of the review

**Originality** All injury causes considered, attention paid to where the evidence comes from, WHO European region as the focus

**Strengths** Inclusiveness and coverage (study origin and type; injury cause; publication period 1990-2006)

**Contribution** A demonstration of the geographical bias of the evidence accumulated thus far (e.g., most often from high income countries from Northern Europe and North America); a demonstration of the imbalance in studies across injury causes; a demonstration of the scarcity of interventions addressing the reduction of socioeconomic differentials in injuries

**Limitations** Literature search limited to selected databases; quality assessment of individual studies not provided; one reviewer by study (and injury cause)

The volume of articles published during the past twenty-five years or so on the socioeconomic patterning of injuries is impressively high but, in the main, the bulk of them are descriptive.

When not aggregated, injuries are grouped in various manners (e.g., cause – most often – or body location or setting) and relative distributions across individual or area socioeconomic descriptors are presented.

All injury causes, all settings, and all age groups are not covered to the same extent.

Of about 300 studies reviewed, self-directed violence is definitely the cause of mortality and morbidity most studied (41% of the studies reviewed), followed by interpersonal violence and traffic-related injuries (16% each). Little attention has been paid to unintentional fall, burn, drowning or poisoning injuries.

Mortality studies dominate the literature reviewed for some injury causes (e.g., self-directed violence, drowning, poisoning) but not all (e.g., road traffic injuries, falls). Morbidity studies are on the increase.

Within the WHO European Region, the injury causes most studied are self-directed violence and road traffic injuries (see box below).

**Number of studies reviewed by region and cause of injury studied**

Region	Road traffic injuries	Other unintentional injuries*	Self-directed violence	Interpersonal violence	All causes or other classifications**
Total	44	25	118	45	48
Within WHO European Region	32	14	54	9	26
Outside WHO European Region	11	8	61	33	19
Multi-country	1	1	3	3	3

\* *fall, burns, poisoning, drowning* - \*\* *setting, body location, type of lesion*

**Sources of the studies – geographically biased**

The studies, though numerous, come from a limited number of countries both outside and inside the WHO European Region. In general, there is a paucity of studies from low- and middle-income countries.

The evidence at hand is therefore mainly representative of some types of countries (governments and economies) and does not encompass many forms of social stratification.

Within Europe, the bulk of the evidence stems from high-income countries and, most often, countries from the North. Whether this is a reflection of those countries being more concerned with equity issues in general has not been examined.

**Countries (or part thereof) covered by cause of injury studied and region**

Causes	Inside WHO European Region	Outside WHO European Region
Road traffic injuries	England, Greece, Ireland, Spain, Sweden, The Netherlands, United Kingdom	Australia, Canada, New Zealand, USA
Other unintentional injuries	Ireland, Spain, Sweden, United Kingdom	Australia, Canada, Peru, South Africa, USA
Self-directed violence	Austria, Belgium, Denmark, Finland, France, Hungary, Italy, Lithuania, Norway, Slovenia, Spain, Sweden, Switzerland, The Netherlands, Turkey, United Kingdom	Australia, Bahrain, Canada, China, Ethiopia, Japan, Korea, New Zealand, South Africa, Uganda, USA
Interpersonal violence	Denmark, Israel, Italy, Russia, Sweden, Turkey, Ukraine, United Kingdom  53 countries from World Health Statistics Annual	Australia, Bangladesh, Brazil, Chile, Egypt, Haiti, India, Japan, Nicaragua, Palestinian Authority, South Africa, Sri Lanka, Taiwan, The Philippines, USA
All causes or other classifications	England, Czech Republic, Finland, Ireland, Lithuania, Russia, Scotland, Spain, Sweden, United Kingdom	Australia, Brazil, Canada, China, USA

**Comparability of the studies – difficult extrapolation of the findings**

Comparisons between studies and extrapolation of the results to other settings are difficult for both operational and structural reasons.

Operationally, the manner in which socioeconomic position and material deprivation are measured varies widely across studies (e.g., measure used and number of levels).

Structurally, the social stratification and the distribution of material and social advantages differ from one

country to another – and even within a country over time – and so does the economic gap between the least and better well-off. This implies for instance that members of a given group though bearing the same label across studies (e.g., low/high income, low/high education level or blue/white collar) are not directly comparable.

### Direction of the findings – some patterns but also inconsistency

Among mortality studies, the empirical evidence very often shows strong associations with individual- and area-based material deprivation. People from low socioeconomic status and from less affluent areas tend to die by injury to a greater extent than others. This has been observed for most causes of injury (e.g., traffic, self-directed violence, interpersonal violence, poisoning, burns) and also for several settings (e.g., home, work, transport).

### Examples of associations between socioeconomic status and injury mortality by cause and from different countries (conducted at the individual or area level)

Cause	Country	Findings
Road traffic injuries		
Studies within Europe		
	Spain <sup>1</sup>	A multi-level analysis from Barcelona revealed a higher risk of traffic death for the population with no schooling, after adjustment of contextual variables for both males and females (RR=4.26 and 4.24 respectively).
	England and Wales <sup>2</sup>	Child injury deaths have fallen in most socioeconomic groups from 1981 to 2001 except for children in families with no adult in paid employment. Steep social gradients are still evident for child injury death as pedestrians.
Studies outside Europe		
	Canada <sup>3</sup>	An area-based study in Montreal and all of urban Canada observed that children living in the poorest neighbourhoods had a four times higher risk for road traffic injuries as pedestrians or bicyclists compared to children in the least poor neighbourhoods.
	USA <sup>4</sup>	A study based on the nationwide personal transportation survey and the Fatality Analysis Reporting System found higher risks of fatal crashes for those who had not completed high school for both men and women (RRs=3.52 and 2.79 respectively).
Burns		
Studies within Europe		
	England and Wales <sup>2</sup>	Rates of death from injury in children aged 0-15 years were compiled by employment status in the family (class) and compared over time for the whole of England and Wales. Despite downward trends in overall rates, inequalities remain, among others, for death from house fires. Compared with children from families with the best occupational status, those from the less favourable ones had a 37.7 times higher death rates due to exposure to smoke, fire and flames.
Studies outside Europe		
	USA <sup>5</sup>	A study from the State of Tennessee on the predictors of mortality from fires in children aged less than five years found that children whose mothers had less than a high school education had a 19.4 times increased risk of a fatal fire event.
Self-directed violence		
Studies within Europe		
	Denmark <sup>6-10</sup>	Conflicting results emerge from several studies, with no association found between socioeconomic status and suicide after adjustment for other factors, a reduced risk of between 0.35-0.93, or an increased risk of between 1.14-3.26 with lower socioeconomic levels, depending on the measure used, its level, and the sex and psychiatric history of the victims.
	Lithuania <sup>11</sup>	A study found that compared to employees, workers had 3.68 times the risk of suicide, although education level had no effect.
	Sweden <sup>12-15</sup>	A number of studies found that people in rented accommodation as compared to that which is owner-occupied had a 1.34-2.09 times higher risk of suicide, although not for all age groups. Despite some inconsistencies, lower socioeconomic status (lack of

		car access, lower education, unskilled workers, overcrowding) was generally associated with a 1.15-4.0 times higher risk of suicide.
	United Kingdom <sup>16,17</sup>	One study showed that lower deprivation was associated with lower risks of suicide for males (adjusted RRs between 0.66 and 0.96) and females (adjusted RRs between 0.50 and 0.90).
		After adjustment for several other variables, including social fragmentation, one study found that the risk of suicide decreased with increased deprivation for males aged 15-44 (RR=0.88) and females aged 45-64 (RR=0.85); but the risk increased with low social class for males aged 15-44 (RR=1.12).
<b>Studies outside Europe</b>		
	Australia <sup>18-20</sup>	In a number of studies increased disadvantage was associated with a 1.12-1.66 higher risk of suicide. Fewer associations were seen for females and in one instance, increased disadvantage was associated with a decreased suicide (RR=0.80-0.88).
	Canada <sup>21</sup>	Compared to people with moderate/high income, those with low income had a 3.2 times higher risk of suicide.
	Korea <sup>22</sup>	A study found that those in lower social classes were 1.26-1.82 (males) and 1.35-2.11 (females) times more likely to commit suicide as those in the highest social class.
	New Zealand <sup>23-26</sup>	Several studies show that lower socioeconomic status (education, income, no car access) was associated with 1.33 to 7.0 times the risk of suicide.
	South Africa <sup>27</sup>	A city-level study found that, except for blacks, lower levels of socioeconomic circumstances were associated with a decreased risk of suicide (ORs between 0.23-0.57, depending on demographic group).
	USA <sup>28-30</sup>	Different studies have found evidence of an increased risk of suicide with both higher (ORs 1.43-1.92) and lower (RR=1.33-2.28) socioeconomic status.
<b>Interpersonal violence</b>		
<b>Studies outside Europe</b>		
	USA <sup>31</sup>	A multilevel study found an approximately twofold increased risk of homicide associated with living in a neighborhood characterised by low socioeconomic status, after adjusting for individual demographic and socioeconomic characteristics.

1 Borrell et al. 2002

2 Edwards et al. 2006

3 Dougherty et al. 1990

4 Braver et al. 2003

5 Scholer 1998

6 Mortensen et al. 2000

7 Agerbo et al. 2001

8 Agerbo et al. 2002

9 Qin et al. 2000

10 Qin et al. 2003

11 Tamosiunas et al. 2005

12 Johansson & Sundquist 1997

13 Johansson et al. 1997a

14 Johansson et al. 1997b

15 Rubenowitz et al. 2001

16 Rezaeian et al. 2005

17 Middleton et al. 2004

18 Taylor et al. 1998

19 Taylor et al. 2005

20 Page et al. 2002

21 Holley et al. 1998

22 Kim et al. 2006

23 Beautrais 2001

24 Beautrais 2003

25 Blakely et al. 2002

26 Blakely et al. 2003

27 Burrows & Laflamme 2005

28 Kung et al. 1998

29 Iribarren et al. 2000

30 Steenland et al. 2003

31 Cubbin et al. 2000b

Studies based on morbidity are on the increase. Using a variety of data sources and severity criteria, they provide results somewhat less consistent than those of mortality studies. Nonetheless, numerous studies show considerable differences between socioeconomic groups even for less lethal injuries of various kinds.

**Examples of associations between socioeconomic status and injury morbidity by cause and from different countries (conducted at the individual or area level)**

Cause	Country	Findings
Road traffic injuries		
Studies within Europe		
	Greece <sup>1</sup>	Children residing in less wealthy towns had almost double the risk of having pedestrian injuries compared with children living in wealthier towns.
	Sweden <sup>2</sup>	National studies based on individual data indicate that low socioeconomic position is related to a higher risk of road traffic injuries. The injury risk of pedestrians and bicyclists are 20-30% higher among the children of manual workers than those of intermediate and high level salaried employees. Socioeconomic differences increase for injuries involving motorised vehicles (RR between 1.70-1.80).
	United Kingdom <sup>3,4</sup>	A cross sectional survey in Trent showed that children in the most deprived areas had a nearly 4 times higher risk for pedestrian injuries compared to children in the most affluent areas.
Studies outside Europe		
	New Zealand <sup>5</sup>	A study conducted in the Auckland region revealed that the risk of pedestrian injuries among children in the lowest socioeconomic groups was twice that of children in the higher socioeconomic groups.
Burns		
Studies within Europe		
	United Kingdom <sup>6</sup>	A study conducted in Lancashire and South Cumbria on burn and smoke inhalation in secondary care (all ages) revealed an increase in admissions with increasing social deprivation: a 3% increase in injuries per thousand population for every increase of one unit in the Townsend deprivation score.
Studies outside Europe		
	Peru <sup>7</sup>	A study conducted in Lima observed that household lack of water supply, low income, and crowding were associated with an increased risk of hospitalisation for burn injuries among children (ORs=respectively 5.2, 2.8 and 3.9).
	South Africa <sup>8</sup>	In the Cape Town region, an area-based study on paediatric burns revealed graded associations between housing conditions and hospitalisation for burn injuries (OR=2.39 and 3.33) for poor and impoverished neighbourhoods compared to favourable ones.
Falls		
Studies within Europe		
	United Kingdom <sup>9,10</sup>	A study on the association between material deprivation and the incidence of hip fracture among young adults and older people was conducted in Wales revealing significantly higher incidences in poorer electoral wards (Townsend index) among young adults (RR 1.64) but not among the elderly. The association diminished with age, and was not observed in people aged 85 and over (RR=0.94).
		A study in Trent considered both falls and hip fractures among people aged 75+ years. A small but significant association at electoral ward level between material deprivation (Townsend score) and hospital admissions was observed for falls (but not hip fracture), with the most deprived wards having a 10% higher admission rate (adjusted) compared with the most affluent wards.

Cause	Country	Findings
Self-directed violence		
Studies within Europe		
	Denmark <sup>11</sup>	Adolescents with no vocational training and not graduated from high school showed 1.5 and 1.8 times the risk, respectively, compared to those with such education.
	Hungary <sup>12</sup>	A study among repeat suicide attempters found males and females with low education had more than twice the risk of those with high education. The adjusted OR was highest for males at 3.37.
	Norway <sup>13</sup>	Hospitalized youth with parents in a low social class showed a 2.4 increased risk (adjusted for age and sex) compared to those with higher classes.
	Sweden <sup>14-18</sup>	Several studies showed that compared to children of parents with high socioeconomic status, those of parents with lower status levels had between 1.13 to 3.30 times higher risk of attempted suicide. Boys and girls from households who received welfare benefits had approximately three times the risk of those with parents who had not received such benefits.
	Turkey <sup>19</sup>	Lower parental education was associated with 6-7% higher risk in adolescents.
Studies outside Europe		
	Australia <sup>20,21</sup>	Compared to those living in areas of low socioeconomic disadvantage, males and females in areas with high disadvantage had 2.71 and 1.92 times the adjusted risk, respectively. Similarly, at an individual level, low status (except by educational level) was associated with a 2.88-3.4 higher risk for males and 1.82-4.0 higher risk for females, after adjustment.
	Canada <sup>22</sup>	A study on adolescents showed that those with a mother (but not a father) with less than high school education had 2.48 the risk of suicide attempts compared to those who had a mother with high school level.
	New Zealand <sup>23-26</sup>	In several studies among youth (under 25 years), those with lower socio-economic status had up to a 7.7 higher risk compared to those with a high status level.
	USA <sup>27,28</sup>	Some studies have shown an increased risk among those with low socioeconomic status of up to 8.43 for males and 3.46 for females.
Interpersonal violence		
Studies within Europe		
	Italy <sup>29</sup>	A study on intra-family violence toward children found that families with a low income had a significant (adjusted) association with the rate of minor violence (Wald chi-square values = 5.4) but not severe violence.
	Turkey <sup>30</sup>	A study of over 800 pregnant women showed that during pregnancy 31.7% of women were exposed to any form of violence. Emotional violence was the most frequently reported form (26.7%), followed by sexual (9.7%) and physical violence (8.1%). Low education level of husband (OR=1.7) and low family income (OR=1.9) were among the four main predictors of overall violence during pregnancy.
Studies outside Europe		
	Bangladesh <sup>31</sup>	A study conducted in six Bangladesh villages (about 1200 women surveyed) investigated the experience of domestic violence in the past year. The proportion of women who reported experiencing domestic violence was significantly higher among women with a dowry agreement than among women with no such agreement (45% vs. 25%) and among women with a marital household socioeconomic status at or below the median for the sample (42% vs. 22%). No differences were observed for education.



Cause	Country	Findings
	Haiti <sup>32</sup>	A national study investigated ever married women's risk of experiencing emotional, physical and sexual violence and multiple forms of intimate partner violence in the past 12 months. 25% experienced some form of intimate partner violence during the past 12 months and 13%, two different forms. Significant positive associations with all forms of violence were found for lack of completion of primary school (ORs=1.9, 2.2, 1.8 respectively) and when the female alone made the final decision on large household purchase (ORs=2.7, 1.7, 1.7). Neighbourhood poverty was additional risk factors for sexual violence (ORs=1.8 and 2.4 for villages with medium and high poverty level compared with low), as was male-dominated financial decision-making (OR=2.5).
	South Africa <sup>33</sup>	A study on sexual abuse among adolescents revealed that family structure was significantly related to rape as persons who lived with a single parent (OR=1.74) and those who resided with one biological parent and one step parent (OR=2.59) were more likely to have been victims of sexual abuse than those living with both biological parents. Family socioeconomic status was marginally significant.
	USA <sup>34</sup>	A study on physical violence against children revealed that families below 200% of poverty are more likely to engage in physical abuse, although they do not appear more likely to engage in violence in general. By contrast, in the particular case of single-parent families, those with incomes between 100 and 200% of poverty were significantly more likely to engage in physical abuse than the poorest families (200% of poverty): 14.2% for families at 100-150% and 11.7% for those at 150-200%.

1 Moustaki et al. 2001

2 Hasselberg et al. 2001

3 Coupland et al. 2003

4 Hippisley-Cox et al. 2002

5 Roberts et al. 1995

6 Rajpura 2002

7 Delgado et al. 2002

8 Van Niekerk et al. 2006

9 Jones et al. 2004

10 West et al. 2004

11 Christoffersen et al. 2003

12 Osváth et al. 2003

13 Grøholt et al. 2000

14 Engström & Laflamme 2002

15 Engström et al. 2002

16 Engström et al. 2003

17 Engström et al. 2004

18 Mittendorfer-Rutz et al. 2004

19 Toros et al. 2004

20 Taylor et al. 2004

21 Taylor et al. 2005

22 Langille et al. 2003

23 Beautrais et al. 1996

24 Beautrais et al. 1998

25 Beautrais et al. 2003

26 Beautrais 2001

27 Iribarren et al. 2000

28 Zhang et al. 2005

29 Bardi & Borgognini-Tarli 2001

30 Karaogla et al. 2006

31 Naved & Persson 2005

32 Gage 2005

33 King et al. 2004

34 Berger 2005

Restrictions in the review process undertaken by the research team, and publication and other selection biases not under the team's control may yield an overrepresentation of studies showing socioeconomic differences.

### Possible mechanisms – studies on causality uncommon

The distribution of explanatory risk and protective factors across socioeconomic groups has been studied to a limited extent and only for some causes. The most sophisticated designs are found above all in research on self-directed violence and in some instances in traffic studies.

The literature consequently remains silent regarding the nature of the mechanisms lying behind socioeconomic differences in injury mortality and morbidity.

Altogether, mortality and morbidity studies suggest that the socioeconomic patterning of injuries can be multifaceted, influenced by a variety of individual and contextual mechanisms.

Multilevel studies strongly indicate that mortality and morbidity differentials across people from different socioeconomic backgrounds are a reflection not only of individual mechanisms but also of contextual ones.

The mechanisms likely to explain those differences may vary by cause of injury, sex and age group of the

victim and also the setting of injury occurrence.

### **Interventions are seldom evaluated with regards to their socioeconomic differential**

Interventions addressing the differential impact of safety interventions on various socioeconomic groups and areas are few and limited in scope. Most of them concern injury prevention among small children and focus on home safety.

Not surprisingly, as a consequence of the above, most interventions of that kind deal predominantly with the use of safe practices and of safety equipments, which represent one of several possible targets for reducing socioeconomic inequalities in injuries i.e., reducing differential susceptibility (see next chapter).

Promising avenues for prevention such as the reduction of differential exposure to hazards or interventions aiming at reducing differential consequences of injuries have received negligible attention.

The research at hand provides a poor evidence base as to how to avoid – or narrow down – social differences in injury risks. It is therefore unclear whether prevention works best where it may be needed most.

European countries are no exception to the above.

Interventions targeted at low socioeconomic groups – or areas – have not been included in the review process as their evaluation is not concerned with their potential for actually reducing the safety divide. Yet, the “levelling up” potential of this kind of approach is discussed below in terms of the various mechanisms of health and safety they may help tackling.

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## Chapter 8: paving the way to equity in safety – possibilities and challenges

The point has been strongly made by several policy makers and opinion builders that the maintenance and increase of social inequalities in health constitute major threats to the achievement of health targets set up by various nations of the world (e.g., raising life expectancy or average health status), including those of the European region.

Besides being a threat to collective health targets, health inequity is also unfair to individuals. Indeed, poorer chances of survival and poor health, when generated by social processes to the detriment of the less well-off impede basic human rights (Kawachi et al. 2002; Whitehead and Dahlgren 2006a; 2006b).

Further, health inequities in general and inequity in injury in particular are neither unavoidable nor irreversible (Laflamme 1998; Laflamme 2001; Laflamme and Diderichsen 2000; Engström 2003; Hasselberg 2004; Whitehead and Dahlgren 2006a; 2006b). There are eloquent sectoral examples of passive safety dealing with physical exposures and showing for instance that tackling material deprivation in the home through better housing conditions (Berfenstam 1979; 1995), modifying or isolating hazards in workplaces (Menckel and Kullinger 1996) or modifying the traffic environment (Berfenstam 1979; Jones et al. 2005; Tester et al. 2004) can do much to “level up” safety differentials between members of different social groups.

### Data are essential and imperative

Counteracting the current national trends of increased (relative) inequities in health observed in many different countries in and outside Europe will require multisectoral efforts of various kinds. For economic, social, and health policies aimed at reducing those differences to be well tailored, data are required. National, regional and local situations as they currently appear, as well as how they evolve over time, need to be documented (WHO 2007). This is most unfortunate as one striking feature of the evidence on social disparities in injury and safety revealed by this review is its geographical bias and the paucity of such data from numerous countries, both inside and outside the WHO European Region.

Against this background, it is imperative for the development of equity-oriented strategies aimed at “levelling up” the injury situation of the most deprived that adequate data be made available, both social group and outcome specific (Braverman et al. 2005; Whitehead and Dahlgren 2006b). Social group specific data can be used to map safety differentials as they currently appear and as they have evolved retrospectively over time. They may be useful for the setting of priorities for action and for determining the allocation of health services according to need. Undeniably, as the etiology of various kinds of injury may differ, cause-specific mappings are a must and setting-based ones (e.g., home, transport, work, and school) are highly desirable. Also, whenever possible, social position should be looked at in gender-, age-, ethnicity, and class-specific groups (Whitehead and Dahlgren 2006b).

The challenge is not small as it has been estimated that of the 192 WHO Member States, only 111 currently report injury mortality data, as assessed by WHO. 45 of the 53 Member States in the WHO Regional Office for Europe have vital statistics with data with ICD9/10 external cause coding (WHO 2008). It is therefore likely that the above will have to be integrated into broader efforts to launch ongoing violence and injury data collection systems – or improve current ones – or perform population-based surveys.

**Essential elements to the determination and follow-up of inequalities in safety**

(based on: Dahlgren and Whitehead 2006b)

- Both absolute and relative differences should be used to express inequities in health
- To measure individual social position, income, occupation or education should be used. If possible, several measures rather than one
- If data are not available at the individual level for comparison, use area-based data (e.g., privileged vs. less privileged)
- Whenever possible, social position should be looked at in gender-, age- and ethnicity-specific groups
- Injury as a cause of death or morbidity should be considered all causes aggregated as well as cause-specific
- Efforts should be made to split injuries not only according to cause but also according to site/setting of occurrence

Besides gathering and producing data for policy and action, research that goes beyond the description of safety inequities and addresses the underlying material and psychosocial pathways by which different factors produce safety inequalities (Kawachi et al. 2002) is of high importance in the field of violence and injury prevention. Country-specific and cross-country studies are both desirable (Lu et al. 2005). Each country has its own history and culture and country-specific studies will highlight the magnitude of the safety divide and provide an understanding of what particular pathways may shape differences between social groups. Cross-country studies will provide an understanding of how social contextual differences come into play (Lu et al. 2005).

But undertaking action must not be conditional to the above. Given the alarming negative trends, waiting for data and evidence is not an option. Even without perfect data, preventive and protective action is imperative (Whitehead and Dahlgren 2006b; Sethi et al. 2006).

**What countermeasures can be envisaged to address the safety divide?**

To paraphrase others there is no strategic blueprint for tackling the safety divide (Whitehead and Dahlgren 2006b). In fact, when determining an agenda for policy and practice, it is of paramount importance to distinguish between options related to the social determinants of health for the overall population and those related to the social determinants of inequities in health as they may be quite different (Whitehead and Dahlgren 2006b). This is likely to apply to injuries in particular.

For health targets to be reached and sustained, not only health-for-all policies and interventions are

Socioeconomic inequality in violence and injury occurrence and consequences arises because people are variously disadvantaged according to socioeconomic group due to one or several of the following, each referring to one specific type of prevention:

- |  |                                    |
|--|------------------------------------|
| ➤ differing opportunities for safety (e.g., some face higher structural risks and have fewer chances of avoiding injuries);  | <b><i>Primary prevention</i></b>   |
| ➤ differing opportunities to avoid risk (e.g., some are at greater circumstantial risk due to limited chances to compensate for – or cope with – danger and avoid injury); | <b><i>Secondary prevention</i></b> |
| ➤ differing access to/use of medical care (for treatment and for rehabilitation)   | <b><i>Tertiary prevention</i></b>  |



required but even equity-oriented ones are imperative, both within and outside the health policy domain (Whitehead and Dahlgren 2006a; 2006b). Equity-oriented measures may build on initiatives aimed at narrowing the safety divide between the worse- and better-off or on focusing on people or neighbourhoods in poverty only.

### Safety-for-all strategies

In the injury field, there are numerous interventions for the prevention and control of violence and injuries that have been evaluated and promoted as effective. Those are found listed in various reports, including a few published by the WHO during the past years: one being specific to road traffic crashes (WHO 2004), others concerning the prevention of both unintentional (WHO 2007) and intentional injuries in general (WHO 2002; WHO 2007). It has also been stated that those interventions are likely to be effective regardless of the setting where they will be implemented and that, given particular context-relevant implementation conditions, they are likely to significantly reduce the burden of injuries of various kinds. Yet, it ought to be re-emphasized that few evaluations have been conducted thus far that assess whether population-based interventions are equally effective in all socioeconomic groups (or areas) or if they help reduce differences between those groups.

Below, three safety-for-all types of interventions are highlighted: legislation, community-based interventions, and home safety education and home visitation programmes.

#### **Safety-for-all strategies likely to help in reducing the safety divide**

- Legislation, regulation, enforcement
- Community-based programmes
- Home safety education and home visitation programmes

**Legislation, regulation and enforcement.** The prevention and control of violence and injuries is significantly aided by – sometimes conditional to – well-defined and enforced legislations and regulations (Sethi et al. 2006; WHO 2007). Well-anchored legislations have a strong potential not only to improve safety for all but even to narrow down the safety divide (SOU 2002; SOU 2003). We think here of safety-oriented legislation that determines minimum standards and conditions under which a number of activities or tasks cannot be performed (e.g., at work, during leisure time and sports, on the road). There are also legislations that impose safe behaviours and practices that would not be adopted by all on a voluntary basis only (e.g., car restraints, bicycle helmet use).

And there are legislations that limit access to dangerous products or substances, those being linked to both intentional and unintentional injuries. One example is legislation for firearm sales and ownership. Restrictive legislation can include background checks on applicants, a “cooling off” period before purchasing a gun, and safety tests for applicants; while gun safety measures can include safe storage of firearms and ammunition in the home (WHO 2002). Pesticide regulation too has a strong potential for enhanced safety, as shown in a recent study from Sri Lanka (Gunnell et al. 2007) demonstrating that the introduction of restrictions on the import and sales of WHO Class I toxicity pesticides has had a noteworthy protective impact on self-inflicted poisonings. The same applies to legislation and enforcement in England of maximum sizes for paracetamol and aspirin pack sizes limiting the maximum amount of tablets bought per purchase, with warnings on the packs about the danger of overdose (Hawton 2002). It is estimated that this change in legislation may have prevented approximately 200 deaths in the three years since it was implemented (Hawton et al. 2004). And last but not least, even alcohol consumption may require legislative changes (e.g., reducing access by limiting the opening times of bars

and sales points), given the significant role played by alcohol in most injury outcomes (WHO 2002; 2007).

**Community-based prevention programmes.** Community-based approaches vary in scope and design. They intend to redress the safety level of communities by combining strategies like behavioural and environmental changes, in some instances together with enforcing legislation and subsidies. Community-based interventions have not always been rigorously evaluated, so that assessments of their impact and outcome are not necessarily available. Reviews indicate that community-based prevention may significantly contribute to normative changes in targeted populations, in particular when child safety practice is at stake (Klassen et al. 2000). Programmes can be effective at increasing some safety practices (e.g., car restraint and bicycle helmet wearing) but not all (e.g. reducing adolescent drinking and driving). It is unclear whether they can help to reduce injury risk levels.

Should community-based approaches be adopted, one must keep in mind that success may be conditional to stakeholders' involvement, the adaptation of the programme to community needs and the use of several strategies grounded in a theory of behavioural change (Klass et al. 2000; Farley 2003).

**Home safety education and home visitation programmes.** Home safety education and visitation programmes have aimed at promoting safe practices in the home and also for the prevention of both unintentional and intentional injuries. Several programmes have been evaluated and meta-analyses have been conducted. A series of them, focusing on childhood unintentional injuries and including 80 programmes (Kendrick et al. 2007), reveal that home safety education is effective in influencing the uptake of a range of safe practices, including for example, safe hot tap water temperatures, functional smoke alarms or storing medicines and cleaning products out of reach. Evidence is lacking however as to whether home safety education programmes reduce rates of thermal injuries, poisoning or injuries in general. Interestingly, whether those interventions are less effective in families where children are at greater risks was not a consistent finding.

Another meta-analytical review considered early home visitations' potential to influence child physical abuse and neglect (Guterman 1999). As part of the analysis, the author even assessed whether population-based enrollment strategies were more effective than targeted ones. The review showed that population-based programmes appeared favourable to screening-based ones in early home visitation programmes. An explanation provided was that psychosocial risk screens serve to enrol higher proportions of families for which early home visitation services are less likely to leverage change, and to exacerbate a mismatch between early home visitation service and family needs. This finding is supported by a recent meta-analysis of individual and group-based parenting programmes for the treatment of physical child abuse and neglect. In other words, there is insufficient evidence to support the use of parenting programmes to treat physical abuse and neglect (Barlow et al. 2007).

**Heritage from Haddon: ten strategies.** For those interventions still to be conceived, the field also benefits from a set of ten strategies very well known among public health researchers and practitioners that help to define what, in the injury process, a given intervention specifically tries to tackle (see box below). The strategies have been defined based on a conceptualization of the injury process mirroring the three stages of the development of a disease (pre-crash/event, crash/event and post-crash/event), each stage being related to the three factors involved in an injurious event seen from an epidemiological perspective (Haddon 1980): the individual him/herself, the vehicle or agent, and the environment (physical or social).

<b>Haddon's ten strategies for injury prevention and control</b> (Haddon 1980)	
1. Eliminate the hazard	6. Train and instruct the person
2. Separate the hazard	7. Warn the person
3. Isolate the hazard (time and space)	8. Supervise the person
4. Modify the hazard	9. Rescue the person
5. Equip the person	10. Repair and rehabilitate the person

Whether any strategy is equally beneficial across socioeconomic groups or living areas has seldom been evaluated and can be debated. More fundamentally, the question is how independent of context the impact and effect of Haddon's strategies actually are. In principle, one could presume that the more a given intervention targets the source of danger or the risk itself, by eliminating, separating, isolating or modifying it (passive safety), the better its potential to level up the safety of the less privileged and narrow down the divide between groups. Conversely, the more an intervention relies on the adoption of safe practice (active safety) in otherwise difficult living, commuting or working conditions the less likely its potential to function among deprived individuals and communities and thereby to reduce the safety divide (for a recent illustration of this concerning the use of safety products in the home environment, see Stone et al. 2007; for various strategies concerning child pedestrian injuries, see Bishai et al. 2003; and for paediatric burn prevention, see Van Niekerk 2007).

The potential for various strategies to actually reduce the safety divide or be beneficial to less privileged groups is discussed below.

### Levelling-up and targeted strategies

Having a focus on distinct pathways and mechanisms by which social gradients in safety are brought about is an approach proposed as likely to effectively address the safety divide (Diderichsen et al. 1999; Evans et al. 2001; Mackenbach and Bakker 2002; Towner et al. 2005; Whitehead and Dahlgren 2006b). Below, four such mechanisms are highlighted together with a definition of the type of intervention they entail and a discussion concerning their potential for narrowing the safety gap between groups.

#### **Four mechanisms to tackle socioeconomic differences in injury risks**

- I. Decreasing differential susceptibility
- II. Preventing unequal consequences of injuries
- III. Decreasing differential exposures
- IV. Influencing social stratification

### Decreasing Differential Susceptibility

The concept of *differential susceptibility* links the existence of safety and health differences between people to their social affiliation (Laflamme 1998; 2001; Kawachi et al. 2002; Braverman et al. 2005). Theoretically, related advantages/disadvantages may be regarded as either inherited (i.e., genetic predisposition) or under the influence of class attributes (e.g., educational, material and influential assets).

The kind of strategy favoured to deal with this mechanism in the public health sector is often to target interventions to specific groups. Efforts are deployed to provide "people at risk" with adequate information susceptible to change their safety practice and stimulate the use of safe equipments. This often takes the form of educational programmes, sometimes combined with the free distribution of equipment and even related instructions for use and installation. The rationale is that by giving to members of less well-off groups behavioural and technical means to protect themselves and their offsprings (i.e., by improving their knowledge, attitudes and practices (KAP)) they will be better prepared to prevent injuries from happening. And there are indeed examples of targeted programmes aimed at improving safety practice and the use of safe products that have proven to be successful, in particular concerning childhood injuries. This is the case of the targeted home safety education programmes included in the meta-analysis review mentioned above that successfully promoted the uptake of wide ranging safe practices and, in many instances, contributed to reduce injuries (Kendrick et al. 2007). Other examples of interventions that did improve parental practice in the traffic environment are the distribution

of free toddler car seats (Louis and Lewis 1997) and that of free booster seats – accompanied with training – for older children (Aspler et al. 2003). The latter intervention however turned out to be more effective the younger the children were.

Nonetheless, other evidence shows that too strong a focus on enhanced KAP may be insufficient – perhaps even inadequate – to tackle the safety divide. Indeed, there is an interesting body of knowledge on childhood injuries, mainly in the home, suggesting that the problem faced by people from deprived groups may not be exclusively – or above all – attributable to deficiencies in knowledge and practice. This has been observed in studies from outside (Jan et al. 2000; Ribas et al. 2006) and within Europe, above all from the UK. In Scotland (Lanarkshire) for instance, Evans and Kohli (1997) investigated the home safety measures of parents of young children (aged 3 years) from more and less affluent backgrounds and did not observe significant differences. Rather, differences were in the risks identified in the neighbourhood and in the concerns expressed regarding availability of money to keep one's child safe (see below). In Nottingham (UK), Hapgood and colleagues (2000) surveyed parents' current childcare safety practices of infants (3-12 months), and their knowledge of risk factors for childhood unintentional injury. They found that socioeconomically disadvantaged families had more unsafe practices than more affluent families. Yet, unsafe childcare practices were common regardless of socioeconomic status and few parents undertook safe practices all the time. Also, most of the variation in the number of safety practices was not explained by sociodemographic characteristics. Kendrick and Marsh (UK; 1998) for their part studied the use of babywalkers by parents of infants aged 3-12 months and reached similar results, including that the use of one unsafe item co-existed often with the use of others (e.g., not using stair gates or fireguards). Finally, DiGuseppi and colleagues (*inner London*; 1999a; 1999b; 2002) inspected and tested the installation and function of smoke alarms in a multi-ethnic, materially deprived urban area. They observed that few council properties had any installed, functioning smoke alarms, despite a high risk of residential fires and fire-related injuries in such areas.

In fact, determining what hinders safe practice and acting on that (as a supplement or as a complement) is more likely to help tackle differential susceptibility (Stone et al. 2007; Van Niekerk 2007). Affordability, accessibility, readability and power of influence have been documented as substantial barriers to the uptake of safe practice in economically and socially deprived groups as discussed below.

**High cost as a hindrance.** Affordability as a barrier to the uptake of safe practice has been identified in a variety of studies addressing home safety (Colver et al. 1982; Wortel and de Geus 1993; Sparks et al. 1994; Hsu and Scott 1991; Evans and Kohli 1997) and safety in the traffic environment (e.g., bicycle helmets, child restraint in cars). A recent multi-country study (18 countries split into different income levels) on costs from Hendrie and colleagues (2004) demonstrates that child and family safety devices, when existing, are expensive – sometimes unaffordable – in lower income countries. A bicycle helmet for instance may cost 10 hours of factory work in a low income country and less than one hour in a high income one. Yet, it was also observed that whereas prices – not to mention availability – of child and family safety devices appear to vary widely between countries, price variation for child safety seats and bicycle helmets in particular does not relate strongly to country income. The authors pose that advocacy, social marketing, local device production, lowering of tariffs, and mandatory use legislation might stimulate market growth.

**Low education as a hindrance.** Readability of safety instructions has been stressed in research from the traffic sector. Studies show that safety instructions (e.g., the installation of safety seats) often target a much too high education level (Wegner et al. 2003). Further, as far as skill improvement is at stake (e.g., swimming, driving), offering and multiplying opportunities to acquire those skills may be an important contribution to reduce susceptibility.

**Low power as a hindrance.** Lack of power and means of influence on their living, commuting or working circumstances is a common denominator for most people from less favourable social positions. To compensate for that, advocacy definitely has a place (Nathan et al. 2002) and so too does empowerment.

Empowerment should enable poor people to influence their situation and allow for the setting of priorities and choice of means to be based on their understanding and local expertise (Brock and McGee 2002). Whenever applicable, the voice of specific groups should be heard (e.g., children, parents) (Aynsley-Green 2000).

It should be noted that these are measures that are compensatory and that do not change one's social position *per se* but, rather, intervene on the pathway between low position and injury. Tackling individual social position refers to another kind of strategy and it is dealt with further below.

### Preventing Unequal Consequences of Injuries

The target here is not to avoid injuries from happening but, rather, to find ways to minimize subsequent effects of their occurrence. There is a growing body of research revealing that the spectrum of consequences of injuries is wide-ranging (e.g., physical, psychological and social) for both intentional and unintentional injuries and that some of them are rather long-lasting. Post-traumatic stress disorder is an example of long-lasting consequences, but others include concentration problems at school among injured children and relational difficulties for both children and adults.

The term “consequences” therefore encompasses physical, psychological, and economical dimensions that can be assessed in both the short and long term and be measured at the individual and societal level.

#### Tackling differential consequences

- Accessibility (geographic and economic) of post-trauma care
- Conception of safe product/equipment
- Use of “vision-zero” approach

**Post-trauma care.** One well-established differential consequence of injuries is their lethality or the likelihood to die following an injurious event. Prompt and efficient pre-hospital care can help to reduce the severity of consequences of serious injuries and violence (WHO 2007). This is revealed in many general and cause-specific studies reviewed in this report and in earlier ones. It is clearly evident that post-trauma care can play a determinant role for reducing injury mortality differentials. Related strategies, i.e., availability, access and affordability of hospital care services, may be felt as more urgent in low- and middle-income settings (Razzak and Kellerman 2002; Husum et al. 2003), but their need is more global than that (Whitehead and Dahlgren 2006a; 2006b; WHO 2007).

This is well exemplified in a study conducted by Mock and colleagues (1998) where the outcome of all seriously injured (Injury Severity Score  $\geq 9$  or dead), non-transferred, adults managed over one year were compared in three cities in nations at different economic levels (*Kumasi, Ghana*: low income, no emergency medical service (EMS); *Monterrey, Mexico*: middle income, basic EMS; and *Seattle, Washington*: high income, advanced EMS) and where it was observed that the majority of deaths occurred in the pre-hospital setting. The authors regarded this as an indication that additional efforts for trauma care improvement in both low-income and middle-income developing nations should focus on pre-hospital and emergency room care.

A number of post-trauma care studies have focused more specifically on head injuries. These studies yield inconsistent results. Hawley and colleagues (*UK*; 2004) for instance studied outcomes following head injury among children admitted to one hospital centre and compared outcomes between different severity groups. Globally, only 30% of children received hospital follow-up after the injury. Also, there was a significant association between (neighbourhood) social deprivation and poor outcome. Dunn and colleagues (*Scotland*; 2003) considered adult injuries and found that residing in a more deprived area was

not associated with increased mortality from head injury but was, rather, associated with different patterns of injury and a different process of care following presentation to hospital (including length of stay at hospital). This finding differs from one by Kraus and colleagues (*San Diego*; 1986) who noticed that for those injured, the type of emergency transport, time from injury to treatment, and outcome of treatment were not related to the median income of the census tract of residency.

Over and above differences in injury mortality, even morbidity differences between groups require closer consideration. The current review – as did earlier ones – demonstrates that various types of severe (but not lethal) injuries are not randomly distributed across groups of people and types of neighbourhoods.

**Equipment and product safety.** To minimize the consequences of injurious events, it should be stressed that the development of safe equipment and products has much to offer (Towner et al. 2005). One early example of safe products are flame-resistant nightdresses. While not preventing injuries from occurring, these products limit their consequences and have proven to significantly contribute to the reduction of fatal injuries – for member of all groups.

*Vision Zero.* Even system-oriented programmes putting forward the “Vision Zero”, as is the case for instance in the Swedish road traffic environment, contribute to the reduction of severe consequences; and do so in an inclusive manner. Vision Zero is an approach to road safety endeavours founded on the premise that *no one* should be killed or seriously injured in a collision within the transport system. Increased car-crash safety (e.g., air bags) and traffic calming measures are strategies implemented in accordance with that vision.

### Decreasing Differential Exposures

The concept of *differential exposure* refers to being unequally exposed to various extraneous risk factors or sources of danger that can be found in one’s environment, such as living, commuting and working circumstances (Laflamme 1998; 2001).

#### Tackling differential exposure

- Engineering and product development
- Creating attractive places for recreation
- Maintenance
- Social support

**Engineering and product development.** To tackle exposure differentials, engineering and product development are obvious resources. Referring to Haddon’s ten strategies, it is a matter of ‘modifying’, ‘isolating’, ‘separating’ or ‘eliminating’ the sources of danger. Considering the traffic environment as an example, differential exposure to hazards may be addressed by countermeasures ranging from modifications of the environment itself (e.g., traffic separation, traffic calming) to improvements of the functioning of the public transport systems.

Interestingly, interventions of the latter kind may have positive effects on other factors as well. It is possible that a well-functioning public transport system contributes to an increase in individual and collective security (see the Boston example in Wise et al. 1991). Likewise, better lighting in outdoor environment (e.g., streets, parks, tunnels) may have a beneficial effect on the prevention of both injuries and violence. The countermeasures conceived do not need to be specifically tailored to people or areas at risk. Rather, they can be population-based and benefit all.

In addition to being able to reduce the consequences of injuries (as in the example of the fire resistant

nightdresses mentioned above), product development can play an important role in reducing the accessibility and exposure to various injury risks. For example, changing the design of medication containers can assist in reducing the exposure to poisoning, both unintentional (e.g., child-proof lids on containers) and intentional (e.g., blister packs for medications that can be used in overdose).

***Creating attractive places for recreation.*** The traffic environment is often conceived by adults for adults. Because of that, it may be hazardous and unfriendly for children. The fewer off-street play areas are offered, the more the street environment constitutes not only a means of commuting but also one of recreation. The Harlem Injury Prevention Program is an example of a successful programme aiming at reducing paediatric pedestrian injuries where attractive alternatives for children to being in the traffic environment were created (Durkin et al. 1999). As a whole, the programme was multifaceted – as community-based programmes often are. Besides an educational component (traffic safety education implemented in classroom settings in a simulated traffic environment and theatrical performances in community settings) and the distribution of bicycle helmets (linked to bicycle safety clinics), it included the construction of new playgrounds, the improvement of already existing playgrounds and parks, and a range of supervised recreational and artistic activities for children in the community. During the programme, a reduction of 45% in the incidence of traffic injuries among school age children was observed.

***Maintenance.*** For positive and long-lasting effects of environment and product changes on injuries, maintenance is an essential component. There is an eloquent example from a playground survey conducted by Suecoff and colleagues (1999) who compared playground hazards in high- and low-income neighbourhoods randomly selected from the nine New York City community districts (park design hazards, equipment maintenance hazards, and equipment hazards relating to fall injuries). They observed that approximately one of two parks were located in low-median-income districts and contained 98 (53%) of the total play areas. High- and low-income playgrounds did not differ significantly in the amount or type of equipment, mean fall injury hazards per play area, or mean park design hazards per play area. Yet, significantly more hazards per play area were identified in the low-income group compared with the high-income group.

***Social support.*** Not only an improved physical environment but also a cohesive social environment can play an important – compensatory – role to combat differential exposure. This occurs when parents follow their children or a group of children to school, just to take an example of collective strategies for injury control. Also, several studies from the United Kingdom have used area-based measures of social fragmentation and found it to be more strongly associated with self-directed violence than is deprivation (Whitley et al. 1999; Davey Smith et al. 2001; Middleton et al. 2004; Evans et al. 2004). Similarly, much work has been undertaken linking social cohesion and social capital to interpersonal violence rates (e.g., Kawachi and Kennedy 1997; Kennedy et al. 1998). Additionally, social support at the individual level also plays an important role in reducing the likelihood of both self-directed and various forms of interpersonal violence such as child abuse and intimate partner violence (WHO 2002).

Community development and neighbourhood-based approaches aimed at changing social and cultural behaviour and attitudes of adults and children have an important and instrumental role to play in injury control and safety promotion. Yet, as pointed out by others, these would *reduce*, but not *replace*, the need to narrow the social and economic disparities between rich and poor if we are to reduce inequalities in child injury (Reading et al. 2005). This is what the following mechanism is about.

### **Influencing Social Stratification**

If the higher occurrence of injuries for people from deprived areas is a phenomenon within the areas themselves, targeted interventions and interventions based on either environmental or educational actions may constitute effective policy response. But if other factors and social processes come into play and injury differentials are merely a reflection of a wider web of causation whereby risk differentials result

from systematic differences between classes in living, commuting and working conditions, the response would need to be at a societal level (Erskine 1990; Diderichsen et al. 2001; Whitehead and Dahlgren 2006b).

It is possible to influence the process of social stratification through economic, social and education policies that decrease the divisions between different groups in society and also influence the ease with which social mobility can take place (Diderichsen et al. 1999; Diderichsen et al. 2001).

#### **Tackling social stratification**

- Improve social position
- Improve social mobility

**Improve social position.** In South Africa, an intervention conducted in villages in the rural Limpopo province provided loans to women enrolling in the programme and a participatory learning and action curriculum was integrated into loan meetings taking place every other week (Pronyck et al. 2006). The intervention aimed at reducing intimate partner violence, unprotected sexual intercourse with a non-spousal partner and HIV. After three years, the experience of intimate-partner violence (past twelve months) was reduced by 55% – but not that of the other parameters.

**Improve social mobility.** More generally speaking, the effect and outcome on health-related issues of social interventions can be followed. There is a recent example of such an exercise where some effects of a residential mobility ‘intervention’ in Yonkers (NY, USA) have been measured by Fauth and colleagues (2004). Low-income minority families residing in public and private housing in high-poverty neighbourhoods were randomly assigned via lottery to relocate to publicly funded attached row houses in seven middle-class neighbourhoods. Black and Latino families moved and demographically similar families remained in the original high-poverty neighbourhoods (about 150 families in each group). The families were interviewed approximately two years after movers relocated. It was observed that the adults who moved to low-poverty neighbourhoods were less likely to be exposed to violence and disorder, experience health problems, abuse alcohol, receive cash assistance, and were more likely to report satisfaction with neighbourhood resources, experience higher housing quality, and be employed, when compared with adults who remained in high-poverty neighbourhoods.

#### **Targeted programmes - In summary**

In sum, for health targets to be reached and sustained, equity-oriented programmes are imperative alongside safety-for-all ones. Examples of targeted programmes implemented and evaluated to date have been presented in the above discussion linked to anyone of the four major mechanisms contributing to the existence of social

inequality in safety. Although the presentation may not be exhaustive, a number of features emerge that call for serious consideration. Indeed, the efforts deployed to date can be characterized as follows:

- The programmes conceived do not cover the whole burden of injuries;
- Whereas socioeconomic disparities in self-directed injuries receive a great amount of attention in injury studies, no intervention studies could be identified that aimed at narrowing the gap between groups;
- The vast majority of the interventions addressed are launched so as to improve the knowledge and practice of “at risk” groups, perhaps because other determinants are regarded as less amenable to change;
- They also focus on childhood injuries, in the home or the traffic environment, and in particular



- among young children;
- Few of those interventions have been evaluated considering their potential effect on injury occurrence;
- Interventions addressing mechanisms like differential consequences, differential exposure and differential social mobility are uncommon but those identified yield encouraging results.

### Concluding remarks

The maintenance and the increase of social inequalities in health constitute major threats to the achievement of health targets set up by various nations of the world, including those of the European region. For health targets to be reached and sustained not only health-for-all policies and strategies are required but even equity-oriented ones are imperative. The latter may build on initiatives aimed at narrowing the safety divide between the worse- and better-off or may focus on people (or neighbourhood) in poverty only.

The contribution of injuries to social-health differentials is considerable in very many countries, and prognoses show that the importance of injuries is on the increase. Yet, socioeconomic differences in wealth need not be reflected in differences in safety.

In order to pave the way for sound preventive activities that have the potential to promote safety and reduce inequalities in risks, research is needed to clarify both the mechanisms underlying such differences and the differential impacts of safety measures. The role of research is to provide policy makers with relevant descriptions of the problems faced by individuals, not only by the groups to which they belong.

The achievement of enhanced equity in injury risk distribution and in that of the benefits of prevention may require the following:

- increase awareness of the existence – and preventability – of such inequalities, at whichever decisional level concerned
- set equity as a prerequisite for policy making
- integrate risk distribution as a part of the evaluation process
- pay attention to risk distribution by socioeconomic group both generally and specifically
- keep the equity issue on the agenda

The know-how in injury prevention and control has much to offer to the achievement and maintenance of living, commuting and working conditions favourable to health and safety for all. As is the case in several other fields of action, a commitment towards the reduction of injury risk differentials between social groups will require particular inputs and concerted and multiple interventions.

Reducing inequalities in injury risks and in the benefits of prevention will not be achieved without facing major ethical issues. Undeniably, it will have to be orchestrated while respecting historical, political, geographical and cultural differences; the implication being that no strategy of intervention or means of prevention will be universal.

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## **The WHO Regional Office for Europe**

The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

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Violence and injuries are not only one of the major causes of premature death but are also considered as one of the causes of mortality with the steepest social gradient. This report presents an overview of the current state of knowledge regarding socioeconomic differences in injury risks, reviewing mortality and morbidity studies conducted both inside and outside the WHO European Region, published during the past 17 years and addressing the leading causes of injury, both intentional or unintentional: interpersonal violence, self-directed violence, traffic, falls, drowning, poisoning and burns. Around 300 scientific articles have been selected and reviewed with the aim of highlighting the main features of the knowledge at hand, including where it comes from, how much attention has been paid to various injury causes, which segments of the population have been considered, and whether European studies, when they exist, obtain results that are similar to those from other parts of the world. Studies of interventions that specifically examine outcome effects across socioeconomic groups or areas were also reviewed.

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