Review

Working with families to reduce the risk of home accidents in children

S. Galal [1]

Introduction

Accidents are one of the five leading causes of death in industrialized and developing countries. Injuries arising from accidents are an increasing public health problem. Yearly, 10% of children suffer an accident for which it is necessary to contact the health services [*1*].

Children, being less aware of danger, are one of the most vulnerable groups. Younger children are more vulnerable indoors, while older ones are more at risk outdoors. There appear to be "gender types" of accidents; males tend to have more accidents outdoors while females tend to have accidents indoors. Accidents are also related to the prevailing socioeconomic and cultural conditions.

Productivity lost from a childhood injury is for a far longer period of time than for adults; it might be even for life. In case of disability an adult can be rehabilitated but for a child the compensation is often more difficult, although for many kinds of trauma, children heal more quickly than adults. Potential years of life lost as a result of accidents before 65 years for some industrialized countries range between 38% and 59% of the total potential years of life lost for people aged 1–24 years and in some developing countries between 4% and 47% [*2*].

In many industrialized countries, there are safety regulations and laws with regard to buildings and living areas which are supported by control measures. However, in developing countries, while regulations for safety measures often exist, they are seldom enforced, especially in rural areas, shanty towns or informal dwellings.

Interest in registration and monitoring of accidents has risen in the past 4 decades, especially for home accidents as evidenced, for example, by the first worldwide accidents study (1950–1971) among children [*3*] and the establishment of the Home Accident Surveillance System (HASS) in the United Kingdom in 1973–74. In addition, in 1986 the European Community set up the European Health and Leisure Accident Surveillance System (EHLASS) to collect mortality and morbidity data related to domestic accidents [*3*].

Although many countries register mortality causes, often they are not very reliable and the results are either under- or overestimated. Primary data registrators are often not data conscious and if legal problems may arise, they prefer to categorize a death under a less problematic cause.

Education for prevention of injuries has been attempted since the seventies in France, United States of America, Australia [*1*] and in some developing countries [*4*].

[1]*Faculty of Medicine (Girls), El-Azhar University, Cairo, Egypt.*
Received: 11/06/98; accepted: 01/09/98

Approaches to education addressing parents or primary-school children are a concern of governmental as well as nongovernmental institutions. Ministries of education, ministries of health, or voluntary associations have generally initiated educational programmes; they have chosen either teachers, health personnel or community leaders for the educational process.

Definition of accident

Often people interchange accident (event) and injury (consequence) [*1*]. However, not every accident leads to injury (Figure 1).

In young children, differentiating between accidental injury and maltreatment is not easy, which presents methodological problems in the collection and processing of data. Also, differentiating between injury and suicide is difficult. It is even harder to identify accidents with no injuries. Moreover mental trauma is not always taken into consideration although it should be.

In his study, Tursz [*6*] excluded premeditated violence (attempted suicide and battering) and sudden infant death and defined an accident in childhood as "a potentially harmful, unexpected, unintended and abrupt occurrence affecting a child, which may or may not produce injuries, and which leads to medical consultation."

According to Manciaux and Romer [*7*] an injury is "damage to a person caused by a transfer of energy: mechanical, thermical, chemical, electrical, or radiation." Graicer et al. [*8*] added also "or from the absence of such essentials as heat or oxygen."

In developing countries the definition of home accidents should also include a special category for home-based work accidents. There is often no distinction between home and work especially in rural areas. Wilson [*9*], categorized also "occupational" injuries of children as it is known that many of them work in unskilled and poorly paid jobs in agriculture, animal handling and food preparation.

In many surveys injuries are classified according to the International Classifica-

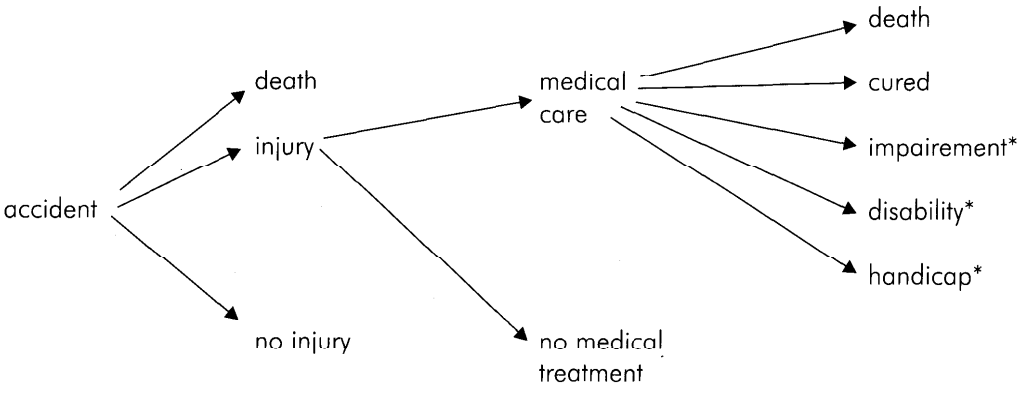

Figure 1 **Accidents and their possible consequences**
*Impairment means lacking part or all of a limb or having a defective limb, organization or mechanism of the body. Disablement means the loss or reduction of functional ability. Handicap means the disadvantage or restriction of activity caused by disability [*5*].

tion of Diseases (ICD) [*10*]. However, this classification is less appropriate for the minor accidental injuries that are seen in outpatient practice as a result of domestic accidents to children. According to the Home Accident Surveillance System in the United Kingdom, 1973–74, it was estimated that two-thirds of injuries due to accidents at home in England and Wales were treated in hospitals and one-third by general practitioners [*6*]. The World Health Organization (WHO) has developed a system of lay reporting of health information, one to be used by non-health professionals in the community [*11*].

Table 1 **Common causes of childhood injury according to age group**

Cause	Age group (years)		
	Under 1	1–5	6–10
Burns and scalds	+	+	+
Falls	+	+	+
Poisoning	–	+	+
Animal bites, snake bites	+	+	+
Drowning	–	+	+
Motor vehicles	–	+	+
Agricultural accidents	–	–	+

Causes of accidents

While accidents are the fifth leading cause of death worldwide [*1*], they are the first among children and young adults in industrialized countries. Since the first worldwide accidents study (1950–1971) among children [*3*], knowledge about the situation has improved.

Accident mortality and morbidity in developing countries is as common as in industrialized countries [*12*]. However, the consequences of accidents are often more serious because of more dangerous environmental conditions, the introduction of new technology without safety measures, the lack of accessibility to and the poor quality of services, as well as people's unawareness.

Children constitute about 40% of the population in developing countries [*13*]. Together with infectious diseases, accidents resulting in injuries among children are the leading causes of death. Living conditions in rural areas, such as cooking over open fires, lead to burns and scalds. Badly built houses and poor maintenance, such as stairs without railings, might cause falls. Accidental drinking of kerosene stored in soft-drink bottles leads to poisoning of children. Table 1 shows the common causes of injury in children in developing countries according to age group as found by Thapa [*14*]. In his table, Thapa did not include causes related to electricity or sharp instruments, such as electric shock and cuts and wounds, which are very common in home accidents [*15*]. Many developing countries have electricity even in rural areas but because of their ignorance people sometimes underestimate the dangers connected with it. Often electrical wires are exposed, and children are left on their own with no supervision, which makes the dangers greater.

The leading causes of injury deaths by age group in the USA are shown in Table 2 (adapted from the National Safety Council, 1981) [*9*]. In Aquitaine region of France, the leading types of accidents in 0–4-year-olds was falls (47.3%) and then poisoning. For 5–14-years-old it was falls (52.2%), then road accidents (25.0%). The type of injury was predominantly head injury — 33.4% in 0–4-years-old and 29.1% in 5–14-years-old [*16*].

Table 2 **Leading causes of injury deaths by age group in the USA**

Under 1 year	1–4 years	5–14 years	15–24 years
Ingestion of food, object	Motor vehicle	Motor vehicle	Motor vehicle
Motor vehicle	Fire, burns	Drowning	Homocide
Mechanical suffocation	Drowning	Fire, burns	Suicide
Fire, burns	Ingestion of food, object	Firearms	Drowning
–	Falls	–	Firearms
–	–	–	Poisons

Source: reference [10]

Thus accident causation and type of injury prevailing in a country are culture bound. The design of a preventive programme has to take these variations into consideration. Even within the same country, home accidents in urban areas are likely to be different from those in rural areas as accidents depend on living conditions and the surrounding environment both indoor and outdoor.

Epidemiological and conceptual models

The epidemiological model can also be applied to injuries as the epidemiological model adapted from Kraus and Robertson shows (Figure 2) [*17*].

They show in their model the interchange between a susceptible host and exposure to the agent of injury via a mechanism of energy transfer. Reservoir in this context is used to visualize the scheme of an energy source and the ways it is transferred, while the agent is energy. Energy can be in the form of mechanical, electrical, chemical, radiation and thermal energy.

The conceptual model has been refined by the Haddon matrix [*7*] taking time continuum into consideration, which helps in the analysis of the event. It is also important for the prevention of injuries (Table 3). Ac-

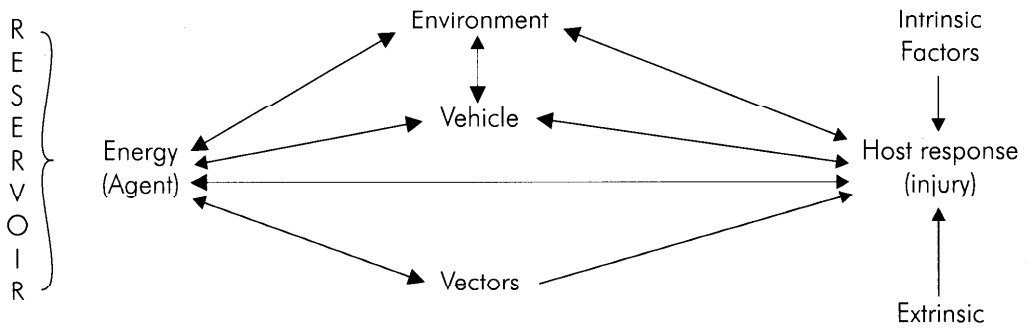

Figure 2 **Epidemiological model (Kraus and Robertson, 1992) [*17*]**

Table 3 **Injury event: Haddon matrix according to Manciaux and Romer**

Phases	Victim (2-year-old child)	Physical environment	Physical, psychological and social milieu
Pre-event	1. Gets hold of a bottle of cola	2. Bottle in reach and attractive	3. Oil is inside
Event	4. Drinks from it	5. Bottle opens easily	6. Child is alone
Post-event	7. Expectorates, vomits, inundates lungs	8. Liquid absorbed?	9. Trying to get the child to vomit

Source: reference [6]

cording to this matrix, intervention possibilities are numerous. Changing the physical environment seems to be more promising than changing human behaviour.

Prevention and control

Prevention of injuries and accidents can be successfully achieved but it is expensive. Burns to children in kitchens can be reduced when safer cooking methods are applied. Poisoning can be decreased if chemicals and drugs at home are properly stored out of reach of youngsters, and children are kept away from cooking or heating gases.

The most effective programmes for home accident prevention and control are comprehensive ones, incorporating diverse factors simultaneously at all levels. Health education is not enough unless it is supported by safety regulations and a system for their enforcement. Health education for injury control has been tried but without much success. Approaches to changing behaviour are not easy, especially if such change requires frequent action or is inconvenient, such as storing hazardous items out of the reach of children [*17*].

However, if health education is given, then it is best given by professionals on an individual basis and tailored according to needs. This approach is more time-consuming and costly, and priorities have to be set for the most vulnerable groups, e.g. parents with children under 6 years of age or day-care centre personnel caring for preschool children. In addition, it seems better to start with items that are perceived as dangerous like poisons or burns, than others not perceived as such.

Rural area programmes will differ from urban area programmes as the main causes of childhood injuries are diverse and related to environment. The agriculture domain must be taken into consideration and also inappropriate housing conditions. Before devising an educational programme, a qualitative observational study of the housing conditions would clarify the specific dangers.

The mass media could be used as a reminder or to draw attention to the problem. Also, engineers should be engaged to help improve the safety of the indoor and outdoor environment.

Educational programmes

Educational programmes for the prevention of home accidents have been approached on different levels. At the national level, the ministries of health can train professionals and paramedicals to educate people in the

prevention of home accidents. Ministries of education can incorporate safety and accident prevention into the curriculum for primary-school children and can train teachers in communicating it best to children. Ministries of communication and information and other related bodies can use the mass media to increase the awareness of parents in the prevention of home accidents and can supply educational and informational materials.

Regulation and legislation for safe house building and environment has to be enforced and inspections of housing conditions should be undertaken. Product safety measures in relation to accidents in childhood were drawn up by the Organization of Economic Cooperation and Development, Committee on Consumer Policy in 1984 [*18*].

At the intermediate level, health professionals can train paramedicals, voluntary workers, teachers, nursery staff, community leaders, community health workers and parents in home accident prevention and control. Local educational and informational materials can be tailored according to local conditions.

At the community level, the education of parents and children has to be launched by trained professionals. Where no environmental instructors or engineers are available, sanitarians can take over control functions. Also, parent groups or children groups might be organized to exchange experiences and find appropriate local solutions for prevention and control of home accidents.

Site of education

Often a comprehensive programme for health education in all sites is not possible either for financial reasons, lack of personnel or other prevailing conditions. A programme specifically designed to assess dangerous home situations leading to home accidents and eliminate them would be the best. However, it might have to start with the existing conditions and in the most cost-effective way.

Within the health service setting

Whether in hospitals or primary health care centres, a room or even a corner is needed for education of parents on home accidents. They might be addressed whenever they come to the service for delivery of a baby, for child treatment or vaccination of the child. Apart from individual education, scheduled public lectures can be helpful and allow the opportunity for group discussions or possible parent groups. To be effective, educational aids in the form of video films, pamphlets or posters should be available.

At home

Home visits give the trained sanitarian, public health worker or community health worker some insight into the dangerous sites existing in and around the house. He/she should address these specifically and, with the parents, look for solutions for their removal or ways of improving the conditions. This might be the most effective approach as it is tailored according to each housing condition. The Division of Public Information and Education for Health of WHO has developed a supplement for assessing skills in developing comprehensive activities for health education [*19*].

In the community

In communities with a large population of children, the whole community can be addressed to develop together a safer environment for the children. This approach might lead to the establishment of community-specific regulations and will give the community the responsibility for control.

People with first-aid skills or others with transport can be listed in case they are needed in a home accident situation. Later, the community health worker might take over the training on an individual basis and according to need.

The Red Cross and Red Crescent Societies developed a community first-aid manual in 1993 [*20*]. Werner and Bower incorporated community education guidelines and child-to-child activity sheets about accidents in their manual *Helping health workers learn* [*21*].

At school

Within the guidelines for the prototype action-oriented school health curriculum [*22*], prevention of accidents and home accidents were one of the items included in the curriculum. It is not enough to include accident prevention in the curriculum; it needs to be integrated within the community and requires collaboration and cooperation with other institutions. The guidelines suggest developing relationships between school, home and community. Often voluntary groups or nongovernmental organizations (NGOs), like the Red Cross and Red Crescent Societies, might be of help to follow up the application and control measures. According to the prototype action-oriented school health curriculum, the following should be stressed with pupils [*23*].

- School-children should be involved in finding out which are the most common dangers in their homes and environment.
- They should consider how potential accident places can be prevented.
- They should know what they can do if an accident happens.

Home accident education

Teaching methods

While it is possible to instruct educated parents in lecture form or provide them with learning material, uneducated parents and children often need other teaching methods, such as demonstrations, group discussion, story-telling, role-playing or learning through activities. In addition, children may profit from educational games or teaching songs. Active participation in the learning process helps retention of the information. Demonstrations, group discussion and story-telling are more convincing than verbal description, clear up misunderstandings and leave a more lasting impression [*23*].

Mass media

Approaches have been launched through the mass media with spots addressing home accidents. However, the impact of such messages has not been clearly assessed. A study in Egypt indicated that educated mothers tend to retain the content of home accident television spots better than non-educated mothers (S. Galal, unpublished study, 1994). McLoughlin [*24*] found no difference in burn rates after a 4-year project on burn prevention in Boston, USA which was based on the use of the mass media, printed material and school lessons. No difference was measured among adults in knowledge gain of burn safety, while students had acquired some information. This might be because the students were exposed to both direct and indirect communication forms and adults might be more burdened with daily life and less motivated to receive instructions.

Parent and child-to-child education

Physicians or health team members as well as teachers or community leaders among

others are the potential educators. The educational programme should specify its objectives based on the knowledge, skills and attitudes required of the learners and should be evaluated in order to obtain feedback.

Parents do not comply with all instructions given to them for the prevention of home accidents among children. As mentioned before, they are more likely to comply with preventive measures for factors they perceive as dangerous, such as burns and poisoning. The Hennepin County Burn Center, a public health agency in Minnesota, USA tried to reduce home hazards for children < 6 years by assessing home safety and making recommendations to parents. Parents' compliance rate for burn prevention recommendations was 42% and for poison control 58%, while for other injury control it was only 19% [*25*].

In developing countries older girls, often out of school, take care of younger siblings. These girls should be educated together with the parents or parents should instruct them or they should receive special education programmes through community organizations.

In various countries around the world, child-to-child health education encompassing accident prevention was launched at the end of the seventies. This approach was connected either to governmental or non-governmental institutions. Child-to-child activities were initiated in primary schools in India, Tanzania and Chile with the ministries of education. In Oman, Nepal and Zimbabwe it was in collaboration with the ministries of health [4]. In Pakistan and Sierra Leone voluntary organizations were engaged in such actions. The most promising programmes were those integrated with other activities for comprehensive health education of the community.

General instructions for parents and older children for the prevention of home accidents

- Look out for places in the home and its surroundings where accidents could happen and take measures to prevent potential ones, e.g. roofs or stairs without railings, broken stairs or unsafe floors, scorpion holes, unsafe electricity wires.
- Make cooking places safe, whether fires or stoves.
- Keep sharp instruments (knives, razors) safely out of children's reach.
- Keep poisons out of the reach of children; bottles with caustic chemicals or acids should be identified and kept out of reach. Never keep kerosene, gasoline or chemicals in soft-drink bottles.
- Keep drugs out of reach of children.
- Supervise small children and babies carefully.
- Hold children back from the road or from animals.

Since burns and poisoning are the most common home accidents in children, the following substances should be carefully monitored: rat poison, DDT and insecticides, lye, bleach and detergents, kerosene, gasoline and petrol, medicines, matches and cigarettes. In the case of poisoning it is important to identify first the poison agent and then start first-aid measures and go to the nearest hospital or health centre.

Strategies for injury control

Most strategies do not prevent injuries but affect their severity. Baker and Wintemute [*26*] have developed the following 10 strategies for the control of unintentional poi-

soning, which is one of the most serious problems in developing countries.

- Do not create the hazard in the first place. (There are always interest groups who benefit and who can fight against it).
- Reduce the amount of the hazard that is produced (e.g. kerosene poisoning).
- Prevent the release of the hazard or reduce the likelihood of its release (e.g. childproof tops for medicine containers).
- Modify the rate of release or the spatial distribution of the release of the hazard, (e.g. medicines produced in single-dose units reduce the likelihood of child poisoning).
- Separate the hazard and its release, in time or space, from the people you want to protect (e.g. storing poisonous material in a safe place).
- Put a barrier between the hazard and people who would otherwise be at risk (e.g. installing a safety barrier for a child).
- Change the basic characteristics of the hazardous agent (e.g. regulating the lead content of paint).
- Strengthen the resistance of people to the hazard (e.g. immunizing susceptible people against insect stings).
- Begin to counter the damage already done (e.g. inducing vomiting of ingested poison).
- Stabilize, provide definitive care, and rehabilitate (e.g. long-term treatment of an agricultural worker with pesticide poisoning).

In conclusion, comprehensive approaches to injury control and prevention are needed; such approaches are likely to be the most effective in reducing childhood injuries. Sweden has had a 35-year campaign to reduce childhood injuries and it has the lowest child-injury rates worldwide [*27*]. Sweden's experience is successful as a result of a combination of the following factors:

- homogeneity of the population
- the health consciousness of the population
- legislation and regulation ensuring safer environments and products
- broad-based safety education campaigns using coalitions of groups
- the length and sustainability of the campaign.

References

1. Romer CJ, Manciaux M. Accidents in childhood and adolescence: a priority problem worldwide. Manciaux M, Romer CJ, eds. *Accidents in childhood and adolescence. The role of research.* Geneva, World Health Organization and Institut National de la Santé et de la Recherche Médicale (INSERM), 1991:1–7.

2. Taket AR, Manciaux M, Romer CJ. Mortality and morbidity: the available data and their limitations. Manciaux M, Romer CJ, eds. *Accidents in childhood and adolescence. The role of research.* Geneva, World Health Organization and INSERM, 1991:9–30.

3. Marcusson H, Oehmisch W. Accident mortality in childhood in selected countries of different continents, 1950–1971. *World health statistics report*, 1977, 30 (1):57–92.

4. Hugh H. *Child-to-child — another path to learning*. Hamburg, UNESCO Institute for Education, 1988.

5. Hogarth J. *Glossary of health care terminology*. Copenhagen, World Health Organization Regional Office for Europe, 1978.

6. Tursz A. Collection of data on accidents in childhood: problems of method. In: Manciaux M, Romer CJ, eds. *Accidents in childhood and adolescence. The role of research*. Geneva, World Health Organization and INSERM, 1991:39–56.

7. Manciaux M, Romer CJ. *Community prevention of accidental injuries in childhood: from knowledge to action*. Geneva, World Health Organization, 1987 (WHO Accident Prevention Programme).

8. Graicer P et al. *Injury in Egypt. Injury as a public health problem*. Cairo, Ministry of Health, Egypt, 1993.

9. Wilson M. Injuries in childhood. In: *Principles for injury prevention in developing countries*. Geneva, World Health Organization, 1985 (unpublished document IPR/ADR 217–40; available on request from the Injury Prevention Programme, World Health Organization, 1211 Geneva 27, Switzerland).

10. *International statistical classification of diseases and related health problems. Tenth Revision*. Geneva, World Health Organization, 1992.

11. *Lay reporting of health information*. Geneva, World Health Organization, 1978.

12. Mohan D, Romer CJ. Accident mortality and morbidity in developing countries. In: Manciaux M, Romer CJ, eds. *Accidents in childhood and adolescence. The role of research*. Geneva, World Health Organization and INSERM, 1991:31–8.

13. *Report of the International Conference on Population and Development, Cairo, 5–13 September, 1994*. New York, United Nations, 1995.

14. Thapa NB. Accidents and injury in childhood. In: Wallace HM and Giri K, eds. *Health care of women and children in developing countries*. California, Third Party Publication Company, 1990:428.

15. Baker MD, Chiaviello C. Household electrical injuries in children. Epidemiology and identification of avoidable hazards. *American journal of diseases of children*, 1989, 143(1):59–62 .

16. Tiret L et al. Incapacity of accidental origin in young people. In: Manciaux M, Romer CJ, eds. *Accidents in childhood and adolescence. The role of research*. Geneva, World Health Organization and INSERM, 1991:57–66.

17. Kraus JF, Robertson LS. Injuries and the public health. In: *Maxcy–Rosenau–Last: public health and preventive medicine*, 13th ed. Norwalk, Connecticut, Appelton and Lange, 1992.

18. Havard J. The role of legislation. In: Manciaux M, Romer CJ, eds. *Accidents in childhood and adolescence. The role of research*. Geneva, World Health Organization and INSERM, 1991:143–8 .

19. *A supplement to the manual on health education in primary health care*. Geneva, World Health Organization, 1986 (Division of Public Information and Education for Health).

20. *Community first-aid manual*. Geneva, International Federation of Red Cross and Red Crescent Societies, 1994.

21. Werner D, Bower B. *Helping health workers learn*. Berkeley, Hesperian Foundation, 1983.

22. *Prototype action-oriented school health curriculum for primary schools, national guidelines*. Alexandria, World Health Organization Regional Office for the Eastern Mediterranean, 1988.

23. *Prototype action-oriented school health curriculum for primary schools, teacher resource book*. Alexandria, World Health Organization Regional Office for the Eastern Mediterranean, 1988.

24. McLoughlin E. Educational approaches to injury control. In: *Principles for injury prevention in developing countries*. Geneva, World Health Organization, 1985 (unpublished document IPR/ADR 217–40; available on request from the Injury Prevention Programme, World Health Organization, 1211 Geneva 27, Switzerland).

25. Sullivan M et al. Reducing child hazards in the home: a joint venture in injury control. *Journal of burn care and rehabilitation*, 1990, 11(2):175–9.

26. Baker S, Wintemute GJ. The "ten strategies" and common injury problems. In: *Principles for injury prevention in developing countries*. Geneva, World Health Organization, 1985 (unpublished document IPR/ADR 217–40; available on request from the Injury Prevention Programme, World Health Organization, 1211 Geneva 27, Switzerland).

27. Bergman AB, Rivara FP. Sweden's experience in reducing childhood injuries. *Pediatrics*, 1991, 88(1):69–74.

Injuries, both intentional and unintentional, are also growing in importance and by 2020 could rival infectious diseases worldwide as a source of ill health.

The rapidity of change will pose serious challenges to health care systems and force difficult decisions about the allocation of scarce resources.

Source: The World Health Report, 1999, *page 14. World Health Organization, Geneva, 1999.*