Preventing Unintentional Injuries in Childhood in Primary Care

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Thesis submitted for the Degree of Doctor of Medicine to the Faculty of Medicine and Health Sciences, University of Nottingham.
September 1997

Contents

Abstract

Unintentional injuries in childhood are a major cause of mortality and morbidity. Numerous risk factors for unintentional injury have been identified over recent years, and there have been several suggestions that injury prevention programmes should be targeted at children identified as high risk, based on these risk factors. There has also been increasing interest in, and emphasis on, the role of members of the primary health care team in preventing unintentional injuries to children, including within recent government policy. There is some evidence, so far, that primary care interventions can be effective in reducing hazards, increasing knowledge and changing behaviour. There is however, less evidence that they can be effective in reducing injury frequency or severity, with very few studies of high quality addressing this issue.

The objectives of the research presented in this thesis are;

to examine the relationship between accident and emergency department attendance and ftiture hosphal admission following unintentional injury, and to consider the transmission of injury data between secondary and primary care and the uses of such data within primary care;

to examine the associations between risk factors for childhood injury and a variety of injury outcomes and to calculate the sensitivity, specificity and positive predictive value for risk factors in identifying children who will subsequently suffer

an unintentional injury, and to consider high risk group and whole population strategies for injury prevention in the light of the findings;

to assess knowledge, attitudes and current practices in childhood injury prevention amongst members of the primary health care team and to consider the implications of the findings for injury prevention in primary care.

The first objective has been achieved by a matched case-control study. The main findings were that children who had been admitted to hospital following an unintentional injury were twice as likely to have previously attended the accident and emergency **(A&E)** department than community controls. However, only one third of hospital admissions had a history of previous A&E department attendance, hence most of the children admitted to hospital would not have been identified using A&E attendance. Current practice in many A&E departments is that a paediatric liaison health visitor notifies the community health visitor of children attending A&E following injury. Most authors in the field discuss post injury follow up visits as an appropriate response to receipt of such notifications, but there is little evidence for their effectiveness, and several studies show such visits are perceived to be difficult for both parents and health visitors. There is little evidence that, at present, injury data transmitted from secondary care is collated in a systematic way, to be used in primary care for needs assessment or injury surveillance. It is therefore recommended that the role of the paediatric liaison health visitor in the collection and transmission of mjury data is in need of fiirther consideration, and that post injury follow up visits require fijrther study to demonstrate their effectiveness.

The second objective has been achieved by a cross sectional survey followed by a cohort study. The main findings from this study are that only previous injury and male sex were associated with A&E department attendance and only previous injury with primary health care team attendance, despite sufficient power to demonstrate associations for several other risk factors. Consequently the sensitivity and positive predictive value of the risk factors in identifying children who will suffer previous injury was found to be low. The specificity was high for most risk factors, suggesting they will miss most children who will have injuries but will correctly identify most children who will not suffer future injury. The number of children needing to be targeted with an intervention to prevent one injury was similar for most risk factors, and similar to that if the whole population received an intervention. The results could not be adequately explained by bias, confounding or insufficient power. Further work examining associations between risk fectors and unintentional injury in childhood is needed with larger sample sizes and in a population with a wide cross section of socioeconomic status to confirm these findings. At present, it is recommended that injury prevention programmes in primary care use a population approach.

The third objective was achieved by a cross sectional survey of general practitioners, practice nurses and health visitors in Nottinghamshire. The main findings from this survey were that health visitors had a significantly higher score for knowledge of childhood unintentional injury epidemiology than general practitioners or practice nurses. They held significantly more positive attitudes to, and were undertaking significantly more injury prevention than, both general practitioners and practice nurses. Despite this both general practitioners and practice nurses held positive attitudes to at least some injury prevention activities.

The activities most commonly undertaken were those using a preventive model of health education, for all professional groups. Activities involving empowerment or radical or political models of health education were used less often. There was little evidence of a systematic approach to injury prevention, with prevention occurring most often opportunistically. For all activities, and across all professional groups, a greater proportion of respondents agreed that an activity should be undertaken than actually undertook that activity, suggesting there may be barriers to undertaking injury prevention in primary care. The difference between the proportion agreeing an activity should be undertaken and doing so, was greatest for lobbying or campaigning and for collecting injury data. The conclusions from this study are that current injury prevention practice, which often uses a preventive model of health education, often as an isolated approach, and most often opportunistically, may not be the most effective strategy for reducing unintentional injuries in primary care.

Further studies are needed to assess the effectiveness of primary health care team interventions offered systematically, using a combination of health education models and approaches. Such studies must address the barriers to injury prevention in primary care. The findings from this study suggest there is already some knowledge, and positive attitudes towards injury prevention, amongst at least some primary health care team members, on which to build interest in such future research.

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Acknowledgements

I should like to thank Professor Richard Madeley, Professor Mike Pringle, Dr Tun Pearson and Dr Katherine Fieldmg for helpful advice and support in preparing this thesis. Thanks are also due to Patricia Marsh, research assistant who worked with me on the third study presented here, and to Joyce Gilbert and Maureen McGowan for secretarial support. I am also grateful to Drs Bratt, Livesey and Ovenden, the partners in my general practice, who supported me, allowed me to use our practice population for some of the research presented here, and who helped share the clinical load whilst I prepared this thesis. Finally, I am extremely gratefiil for all the help and support, including proof reading, provided by Heidi Steward during the original research and the writing up of this thesis.

1. Introduction

1.1 The epidemiology of childhood unintentional injury

1.1.1 Mortality

Above the age of one year unintentional injuries (ICD codes E800-949) account for more deaths than any other cause in childhood. Table 1.1 shows the death rate per million population for children aged 14 years and under, by the three most common causes of death in 1994.

Table 1.1 Childhood mortality by cause 1994. England and Wales. (Death rates per **million** population)

Age	Most common cause of death	2nd most common cause of death	**3rd** most common cause of death
4 weeks -1 year	SIDS 1097	Congenital abnormalities **790**	Respiratory disease **426**
1-4 years	Injuries 52	Congenital abnormalities 49	Respiratory disease 31
5-14 years	Injuries 41	Cancer 34	Diseases of the nervous system 16

(Source: Office for National Statistics 1996)

Sixty years ago the mortality rate for injuries was similar to that for diseases such as tuberculosis, whooping cough, measles and pneumonia. The dramatic decline in mortality from these diseases over the last sixty years has not been matched by a similar decline in mortality for unintentional injury (Avery and Jackson 1993). The current rate of decline in childhood unintentional injury fatality rates was found to be 5.7% per year between 1985 and 1992 (DiGuiseppi and Roberts 1997). If this rate of decline continues, the Health of the Nation target to reduce the rate in children aged 0-14 years from 6.6 to 4.4 per 100,000 by the year 2005 will be achieved (Department of Health 1993a).

In 1994, 449 children aged 14 years and under suffered a fatal injury (ICD codes E800-E949; excluding homicide, suicide and cases where intent was unknown (Office for National Statistics 1997)). The unintentional injury mortality rate was 4.5 per 100,000 per year. The majority of fatal injuries in children under 5 occur in the home (58%), in contrast to fatal injuries in older children where most occur on the roads (71%) (Office for National Statistics 1997). The mechanisms of fatal injury in children aged under 5 and those 5 years and over are shown in Table 1.2

Table 1.2 Fatal injuries by mechanism and age (death rate per 100,000 population). England and Wales 1994.

Injury mechanism	Under 5 years	5 years and over
All external causes (E800-999)	237 (6.9)	314(4.8)
Unintentional injuries(E800-949)	181 (5.3)	268(4.1)
Poisoning (E850-869)	6 (0.2)	2 (0.03)
Misadventures during medical care (E870-879)	4(0.1)	2 (0.03)
Falls (E880-888)	9 (0.3)	10(0.2)
Fire & flame(E890-899)	29 (0.8)	11 (0.2)
Natural & environmental factors (E900-909)	5(0.1)	1 (0.02)
Drowning (E910)	27 (0.8)	7(0.1)
Inhalation & ingestion suffocation(E911;912)	26(0.7)	7(0.1)
Mechanical suffocation (E913)	7 (0.2)	18(0.27)
Other accidents (E916-93 3)	19 (0.6)	18(0.27)
Motor vehicle traffic accidents (E810-819)	45(1.3)	180(2.7)
Vehicle occupant injuries(E812;815;816;819; 4th digits 0,1)	15 (0.4)	44 (0.7)
Motor cyclist (E812.2;812.3;815.2)	0(0)	4 (0.06)
Pedal cyclist injuries(E813.6)	1 (0.03)	26 (0.4)
Pedestrian (E814.7)	27(0.8)	100(1.5)
Pedestrian, other (E800-807; E820-825; E826-829)	4(0.1)	11 (0.2)

(Source: Office for National Statistics 1996)

As unintentional injuries disproportionately affect the young, they account for

8.3% of all potential years of life lost under 75 years of age (Department of Health 1993a). The cost to the NHS of unintentional injuries in childhood has been estimated to be £200 million per annum, not taking account of the longer term costs for continuing care in specialist units, for example for head injured or severely burnt children, or the social costs incurred by parents (Child Accident Prevention Trust 1992).

1.1.2 Morbidity

Unintentional injuries are responsible for a considerable burden of ill health, in addition to the large contribution they make to child fatalities. Each year approximately 120,000 children are admitted to hospital (Child Accident Prevention Trust 1989) and more than 2 million attend accident and emergency departments following an injury (Department of Trade and Industry 1996). Data from the Home and Leisure Accident Surveillance System (Department of Trade and Industry 1996) estimates that in 1994 613,000 children aged under 5 years attended an accident and emergency department following an injury at home, of which 4.4% were admitted to hospital. Four hundred and thirty thousand children aged 5-14 years attended accident and emergency departments following an injury at home, of which 3% were admitted to hospital. Leisure injury attendances are more common in older children, with 1,094,000 estimated attendances in 1994 for children aged 5-14 years, and 189,000 attendances for children aged under 5 years. The admission rate is similar in both age groups for leisure injuries at approximately 3%.

In addition to home and leisure injuries, more than 43,000 children in 1995 were involved in road traffic injuries in England and Wales, of which 16% (6983) were classified as being seriously injured (Department of Transport 1996).

Injuries presenting to the primary health care team are not included in the above statistics, except for the small proportion (Office of Population Censuses and Surveys 1989) which are referred to accident and emergency departments. The Fourth National Morbidity study in General Practice found injuries to be the fifth most common cause of attendance at the primary health care team. The consultation rate for injuries and poisoning (ICD codes 800-999) for children aged under 16 is 1434 per 10,000 children years at risk (Royal College of General Practitioners et al 1995). For the "average" general practitioner with 2000 patients this amounts to 59 consultations annually, or approximately one in six of the childhood population of each practice attending each year.

The majority of non fatal injuries in both age groups arise as a result of falls, both for injuries occurring in the home and those occurring at leisure. The distribution of injury mechanisms by age are similar, except that bums, scalds and poisoning are more common in the under 5 years olds, whilst cutting and piercing injuries, and injuries involving being struck by objects, are more common among older children. The distribution of mechanisms of non fatal home and leisure injuries by age are shown in Table 1.3.

Table 1.3 Injury mechanism by age group for non fatal home and leisure injuries in a sample of accident and emergency departments in the UK, 1994 (%).

Injury mechanism	Frequency in under 5 year olds		Frequency in 5-14 year olds	
	Home	Leisure	Home	Leisure
Fall	12240(40.5)	2120(47.0)	6663(32.2)	11256(41.7)
Struck by object	6515(21.5)	1074(23.8)	6019(29.1)	9017(33.4)
Cutting/piercing	1401(4.6)	158(3.5)	2477(12.0)	1184(4.4)
Foreign body	1963(6.5)	138(3.1)	900(4.3)	329(1.2)
Suffocation	149(0.5)	5(0.1)	106(0.5)	11(0.04)
Poisoning	2086(6.9)	37(0.8)	265(1.3)	52(0.2)
Bums & scalds	1639(5.4)	44(1.0)	626(3.0)	533(2.0)
Pinch/crush	1319(4.4)	235(5.2)	967(4.7)	709(2.6)
Bite/sting	524(1.7)	168(3.7)	682(3.3)	121(0.4)
Electric/radiation	24(0.1)	23(0.5)	33(0.2)	15(0.06)
Other	2383(7.9)	507(11.2)	1969(9.5)	3759(13.9)
Total	30243(100)	4509(100)	20707(100)	26986(100)

(Source: Department of Trade and Industry 1996)

The types of injury resulting from the mechanisms described above are shown below in Table 1.4. This illustrates that chemical injury and concussion are more common in the under 5 years olds, in contrast to bone, soft tissue and tendon injuries which are more common in older children.

Table 1.4 Injury type for non fatal home and leisure injuries in a sample of accident and emergency departments across the UK, 1994.

Injury type	**Frequency in under 5 year olds**		**Frequency in 5-14 year olds**	
	Home	Leisure	Home	Leisure
Open wound	9795(27.1)	1581(27.6)	7258(28.2)	5369(15.9)
Bruise/contusion	5403(14.9)	1010(17.6)	3158(12.3)	5086(15.1)
Other soft tissue injury	5501(15.2)	1090(19.0)	5889(22.8)	10648(31.6)
Chemical injury	2422(6.7)	124(2.2)	551(2.1)	276(0.8)
Bums& scalds	2064(5.7)	83(1.4)	726(2.8)	157(4.7)
Concussion	1824(5.0)	240(4.2)	734(2.8)	839(2.5)
Bone injury	1717(4.7)	321(5.6)	2543(9.9)	4346(12.9)
No injury diagnosed	1378(3.8)	227(4.0)	553(2.1)	689(2.0)
Joint/tendon injury	756(2.1)	200(3.5)	1166(4.5)	2543(7.5)
Non injurious foreign body	1470(4.1)	110(1.9)	692(2.7)	247(0.7)
Other	3873(10.7)	747(13.0)	2505(9.7)	3524(10.4)
Total	36203(100)	5733(100)	25775(100)	33724(100)

(Source: Department of Trade and Industry 1996)

1.1.3 Risk factors for childhood unintentional injury

A risk fector has been defined as "an aspect of personal behaviour or lifestyle, an environmental exposure or an inborn or inherited characteristic, which on the basis of epidemiological evidence is known to be associated with health related conditions considered important to prevent" (Last 1988). Based on this definition, numerous risk factors have been identified for childhood unintentional injury over the last 30 years (Avery and Jackson 1993, Rivara 1992, Baker 1975, Bijur et al 1988a, Eminson et al 1986, Sellar et al 1991, Boyce and Sobolewski 1989, Bijur et al 1988b, Bijur et al 1988c, Wadsworth et al 1983, Stewart-Brown et al 1986). These factors will be discussed below.

1.1.3.1 Sex

The incidence of unintentional injuries, both fatal and non-fatal, has consistently been found to be higher in boys than girls above the age of one year (Office for National Statistics 1996, Avery and Jackson 1993, Department of Trade and Industry 1996). This sex differential exists for home injuries (Office for National Statistics 1997, Department of Trade and Industry 1996), road traffic injuries (Office for National Statistics 1997, Department of Transport 1996), and leisure injuries (Department of Trade and Industry 1996). The ratio of boys to girls in fatal and non-fatal injuries for children above 9 months of age is in the order of 3:2. The reasons behind this sex differential have not been adequately explored as yet. Baker has suggested four possible explanations for differential associations between most characteristics and unintentional injuries. These are differences in exposure, ability to respond, injury threshold or in the probability of recovery (Baker 1975). Sex differentials in injury rates have been explored mainly in terms of exposure to risk of injury. Boys have been found to be exposed to greater risk of injury than girls for road traffic injuries (Towner et al 1994, AA Foundation for Road Safety Research 1994). Girls have been found to be at greater risk of clothing related bums (Avery and Jackson 1993, Baker 1975) and horse riding injuries (Avery and Jackson 1993, Department of Trade and Industry 1996), again related to increased exposure to risk. The ability to perceive risk and respond appropriately may also differ between the sexes. Some studies of children's behaviour suggest that behavioural difficulties are associated with increased injury risk and that boys more commonly display such behaviour (Pless et al 1989a, Bijur et al 1988b), however other studies have failed to find such an association (Pless et al 1989b). There have also been suggestions that locomotor skills develop more quickly in girls than in boys (Langley et al 1980) which may allow girls to respond to the risk of injury more quickly than boys. Differences in injury threshold or the probability of recovery have so far not been explored in terms of childhood unintentional injuries.

1.1.3.2 Age

The 'Thousand Family Study' in Newcastle upon Tyne calculated injury rates in the first five years of life and found the highest rates to occur in the 2nd and 3rd years of life (Miller et al 1974). Eminson and colleagues studying hospital admission rates for injury in children under 5, found the highest rates to occur between the ages of 1 and 3 years (Eminson et al 1986). The mortality rate from road traffic injuries increases with increasing age (Office for National Statistics 1997). The incidence of leisure injuries also increases with increasing age, but that of home injuries decreases with increasing age (Department of Trade and Industry 1996). It is likely that increased exposure and differences in the ability to perceive and respond to injury risk are both part of the explanation of age differentials in childhood injury rates (Baker 1975).

1.1.3.3 Socioeconomic disadvantage

The standardised mortality ratio for injury and poisoning in children from social classes four and five for the years 1989-1992 was five times that for children in social classes one and two (Roberts and Power 1996). The gradient across the social classes is steeper for childhood injuries than for any other cause of death in childhood (Office of Population Censuses and Surveys 1995). At a geographical area level, rather than an individual level, mortality rates are significantly correlated with Jarman scores (Avery et al 1990) and Townsend scores (Walsh and Jarvis 1992).

The relationship between unintentional injury morbidity and socioeconomic disadvantage is less clear, with studies demonstrating conflicting findings. Some authors have found a significant association between childhood injury morbidity and socioeconomic disadvantage, with increased rates of medically attended unintentional injuries in children residing in wards defined as disadvantaged based on census variables (Alwash and McCarthy 1988, Constantinides 1988, Walsh and Jarvis 1992); and in children resident in neighbourhoods classified by their health visitors as poor urban areas (Stewart Brown et al 1986).

However, three recent studies have failed to demonstrate such associations (Lyons et al 1995, McKee et al 1990, Ohn et al 1995) The first study by Lyons and colleagues analysed accident and emergency department attendances for children aged 0-14 years in 1993 at three hospitals within one county of South Wales. All first attendances for injury were included in the analysis. (i.e. repeat attendances for the same injury were excluded). A total of 10,117 first attendances occurred. No significant correlation was found between either car ownership or the Townsend Index of deprivation and the attendance rate standardised for age and sex. Fractures were used as an indicator of severe injury and analysing the results for fractures separately produced identical results (Lyons et al 1995).

The second study by McKee and colleagues analysed a 1 in 20 sample of all new attendances during 1986 at the accident and emergency department of one acute general hospital in a rural area of Northern Ireland. At the level of electoral ward no significant association was found between attendance rate and car ownership, overcrowding, head of household in social class V, or lack of inside bath or toilet (McKee et al 1990).

The third study is a small case control study comparing risk factors for injury among attenders at an accident and emergency department in Glasgow with community controls, which found only significant associations between previous injury and male sex and accident and emergency department attendance. A Scottish deprivation index (ScotDep) was used to measure socioeconomic disadvantage, but no significant difference in level of disadvantage was demonstrated between cases and controls (Ohn et al 1995).

The ecological fallacy, whereby differences at the individual level are masked by aggregating data to ward level, was suggested as a possible explanation for the results in one of the above studies (Lyons et al 1995). However, the ecological fallacy should apply equally to the studies by Walsh and Jarvis, Alwash and McCarthy and Constantinides, yet each of these studies did demonstrate an association between ward level deprivation and injury morbidity.

Another possible explanation is that the socioeconomic variables used in the two recent studies do not describe a group sufficiently homogeneous to demonstrate differences in injury frequency. The study by Lyons and colleagues used the Townsend score which comprises four indicator variables; unemployment, non owner occupation, non ownership of a car and overcrowding (Townsend et al 1988). These variables may not have been stable over the 10 year period between successive censuses. Government policy on the sale of Local Authority housing stock over the last 15 years may have altered the characteristics of home owners between the 1981 and the 1991 census. Both the studies by McKee and colleagues and by Walsh and Jarvis took place in 1986 using census data collected in 1981, hence during that five year period changes in the group of people described by these variables may have occurred. Furthermore, these variables may not describe very similar levels of deprivation in urban and rural areas. Car ownership may be considered more of a necessity in a rural than an urban area, consequently car ownership in the study by McKee and colleagues in rural Ireland, or by Lyons and colleagues in South Wales may not reflect the same degree of deprivation as car ownership in Newcastle in the study by Walsh and Jarvis. The inconsistency between the resuhs of these studies may therefore reflect the tools used to measure deprivation rather than true differences in the relationship between injury frequency and deprivation.

One fiirther possible explanation is that an association only exists above a certain threshold of injury severity. The study by Walsh and Jarvis found significant associations between death, severe injury (injury severity score of 9 or above) and moderate injury (injury severity score between 4 and 8) and deprivation measured by the Townsend score. However, the gradient across the levels of deprivation was steepest for unintentional injury deaths, followed by severe injuries and was least steep for moderate injuries, suggesting that there may be an injury severity threshold below which the association with socioeconomic deprivation may cease to exist. More recent work, again in Newcastle, failed to find a consistent relationship between injury severity and the Townsend score (Walsh et al 1996). An alternative explanation is that factors relating to heahh service utilisation confound the relationship between socioeconomic disadvantage and injury occurrence as measured by accident and emergency department attendance at low levels of injury severity These inconsistent results suggest further work is needed to examine the relationship between injury frequency and a variety of measures of socioeconomic status at the individual and at the aggregated level.

The four explanations suggested by Baker may all play a part in explaining differences in childhood injury rates by social class, or socioeconomic disadvantage (Baker 1975). Children from families living in socioeconomic disadvantage are exposed to more hazards at home (Greaves et al 1994, Glik et al 1993), possess fewer items of safety equipment (Kendrick 1994a) and are exposed to greater risk of injury as pedestrians (Towner et al 1994, AA Foundation for Road Safety Research 1994).

Differences in ability to perceive or respond to risk may also exist across groups differing in socioeconomic circumstances. There is some evidence that those in disadvantaged circumstances perceive greater risk of injury for their children (Roberts et al 1995, Sparks et al 1994) and perceive safety equipment to be equally important as those in more advantaged circumstances (Kendrick 1994a), but the ability to respond to a perceived risk may differ. Families on a low income may be aware of the risks to their children but lack of income may be a barrier to reducing risk, for example by purchasing safety equipment (Kendrick 1994a). Similarly, families renting accommodation or living in temporary accommodation may have little control over the structure of the environment in which they reside (Roberts et al 1995, Child Accident Prevention Trust 1991a).

It is also possible that children suffering socioeconomic disadvantage have a lower injury threshold because they are more likely to suffer from other illnesses or conditions which may influence the outcome of an injury. Walsh and Jarvis however, stratified their results by injury severity and found children from deprived and non-deprived areas died from injuries of a similar severity, suggesting this is not the case (Walsh and Jarvis 1992).

The final possible explanation is that the probability of recovery may differ across socioeconomic groups. This may occur for example as a result of differential access to medical care. This would be most likely to occur with minor injuries as severe injuries are likely to be dealt with by the emergency services for which universal access exists in this country.

1.1.3.4 Family type and structure

The 1970 British Birth cohort has been used for a series of studies examining associations between family structure and childhood unintentional injuries. Children living in step families or single parent families were found to be more likely to have a medically attended unintentional injury, and twice as likely to have a hospital admission for unintentional injury during the first 5 years of life, as children living in a two (natural) parent family. Adjusting for the effect of biological and social variables (number of older and younger siblings, household moves in the preceding 5 years, sex of child, Rutter Child Behaviour Questionnaire score at age 5, maternal age at child's birth and social index), using stepwise logistic regression analysis demonstrated that family type was only significantly associated with injury resulting in hospital admission (Wadsworth et al 1983). One possible explanation for this finding is that admission policy may be influenced by family type, with children from 'atypical' families being more likely to be admitted. As injury severity scoring was not used in this study, it is not possible to conclude either that differential admission policies were in operation, or that children from 'atypical' families were more Ukely to suffer severe injuries requiring hospital admission.

The effect of family size on childhood injury has also been examined using the 1970 British Birth Cohort (Bijur et al 1988c). A significant association was found only between family size and injuries requiring hospitalisation. Three separate logistic regression analyses were undertaken, the first adjusting for social variables, the second for maternal variables and the third for child factors. No analyses were undertaken adjusting for the effects of all factors in one model, despite the possibility that social, maternal and child factors may be correlated. After adjusting for social variables (social class, a measure of affluence and an index of quality of housing), the association was no longer significant. After adjusting for maternal factors (psychological wellbeing, education, maternal malaise, family structure, full and part time employment), the odds ratio contrasting four or more children with only children remained significantly greater than one. Similariy, the odds ratio remained significantly greater than one after adjusting for child factors (Rutter Child Behaviour Questionnaire). When the number of older and younger children was examined, the number of older children was significantly associated with hospitalisation for injury between birth and 5 years of life, but not between 5 and 10 years of life, even after controlling for factors associated with supervision of child care by older siblings.

Birth order was also examined; children occupying a middle birth position were significantly more likely to be hospitalised for unintentional injury than children occupying other birth positions. Birth position is confounded by family size, but restricting the analysis to families with three children to remove this confounding factor did not alter the significant association between middle birth order and hospitalisation for unintentional injuries. A similar association has been found between number of older siblings and drowning and near-drowning incidents in Australia (Nixon and Peam 1978). However none of these studies measured injury severity, consequently it cannot be concluded that the total number of children in a family, the number of older children or the birth position is associated with more severe injuries. The finding that adjusting for social factors resulted in the association between family size and hospitalisation becoming non-significant suggests that social factors may be important in explaining the relationship between family size and hospitalisation, suggesting again that admission policies may be influenced by factors other than injury severity. The authors conclude that family size should be used in conjunction with the other risk factors by health care providers who should be alerted to the increased likelihood of serious injury in these children (Bijur et al 1988c).

1.1.3.5 Maternal Age

The 1970 British Birth cohort has also provided information on the association between maternal age and risk of unintentional injury in childhood Taylor et al stiidied 1031 singleton children of teenage mothers and 10,950 singleton children of older mothers and found an increasing proportion of children experienced an injury as maternal age decreased. Children of teenage mothers were also significantly more likely to have repeated injuries than children of older mothers. This association was demonstrated for injuries occurring in the home and outdoors but not for road traffic injuries or those occurring at nursery schools. Significantly more children of teenage mothers suffered from poisoning, bums and superficial lacerations than children of older mothers (Taylor et al 1983).

Logistic regression analysis was performed to adjust for possible confounding factors, including birth order, neighbourhood, number of household moves, gender, social index, family type and number of younger and older siblings. Maternal age remained significant following adjustment for these factors, suggesting that maternal age has an independent effect on the risk of injury in childhood. The authors suggest that lack of supervision may be a factor as children of teenage mothers experienced similar injury rates at nursery school as children of older mothers. However, Nixon and Peam in an investigation of the sociodemographic factors surrounding childhood drowning accidents in Australia found children of older parents to be significantly more likely to be involved in drowning and near-drowning incidents. They also found that children of higher social class families were at greater risk (Nixon and Peam 1978). This apparent inconsistency with the results from the British Birth cohort may be explained by social class differences in maternal age at birth of first child, and with access to, and ownership of, private pools in those who are socioeconomically advantaged.

The association between young matemal age and childhood injury has been confirmed by a further analysis of the British Birth Cohort which undertook multiple linear regression analysis and found young matemal age (20-24 years) to be one of the factors which was significant in predicting which children aged 0-5 would have a high injury rate in the next 5 years (Bijur et al 1988a). Beautrais and colleagues in a prospective study of a birth cohort of 1124 children found accidental poisoning to be significantly more likely in children with mothers aged under 25 years, and for the association to remain significant after adjusting for sociodemographic variables with logistic regression analysis (Beautrais et al 1981). However, none of these studies have been able to examine the relationship between young matemal age and willingness to seek medical attention as a result of matemal inexperience which could be part of the explanation for this association.

1.1.3.6 Family Stress

Family stress or distress has been found to be associated with childhood poisonings in several studies. Sibert undertook a case control study of 105 children who were unintentionally poisoned and 105 controls matched on age, sex and socioeconomic class. Family stress was measured by interviewing parents within one week of the poisoning and questioning them about serious family illness, pregnancy, recent family moves, one parent away from home, unemployment and depression or anxiety occurring prior to the poisoning. Case families were more likely to report each of the above stresses than control families (Sibert 1975).

Erikkson undertook a similar case control study using three groups of children with poisoning; those admitted to hospital, those attending an emergency room and those whose parents contacted a poison control centre, but who were not advised to seek further medical attention. The control group consisted of age and sex matched children obtained from the register of the child health centre local to the case child. Details concerning the poisoning, socioeconomic factors and preventive measures undertaken by the family were obtained by a postal questionnaire. Case families were significantly more Ukely to report a recent household move and recent acute illness in the family (Erikkson et al 1979).

Beautrais and colleagues (Beautrais et al 1981), in their prospective study of a birth cohort of 1124 children, found a significantly higher poisoning rate amongst children in famiUes with a higher score of life events and stresses (using the Holmes and Rahe inventory). Similarly, the poisoning rate was higher in families reporting changes of residence, parental separation and matemal use of anti-depressants and tranquillisers. When injury rates were adjusted for possible confounding factors, matemal use of tranquiUisers or anti-depressants was the single most important predictor of poisoning. This difference could not be accounted for by increased availability of those medications in the child's home, as a fiirther analysis excluding poisoning with tranquiUisers and anti-depressants found similar results.

Finally, Bithoney and colleagues (Bithoney et al 1986) undertook a small case control study with 23 children hospitalised with ingestion and 23 in-patient controls matched on age, race and socioeconomic status. In-depth matemal interviews were conducted during the hospitalisation of the cases and controls. The interview schedule included data on sociodemographic details, past and current stressful events (eg household moves, personal losses), child care arrangements, parental discipline practices, parental emotional status and parental understanding of child development, as well as factors relating to the child, such as temperament and social maturity. Logistic regression analysis demonstrated significant associations between ingestion and lack of an extended family, few matemal opportunities to escape child care and increased current advocacy needs. Child factors were also found to be significantly associated with poisoning, which occurred more often in children who were less sociaUy mature. The authors concluded that it is important to be aware of the family context in which the ingestion occurs in order that recommendations specific to that family can be made to prevent fiiture ingestions.

1.1.3.7 Disability

There is some evidence that children with sensory deficits are at greater risk of pedestrian injury. Roberts and Norton (Roberts and Norton 1995) undertook a case control study in New Zealand examining this association. Cases (n=l 90) were children kiUed or hospitalized as a result of a pedestrian injury. Controls (n=479) were a random sample of the child population in the study region, matched on age and sex. Parents were interviewed concerning sociodemographic characteristics and the health status of the child. Significantly raised odds ratios were found both for hearing and visual impairment on univariate analysis. Logistic regression analysis was undertaken to control for confounding variables. The adjusted odds ratio remained significant for visual impairment was 4.25 (95% CI 1.68, 10.8) but failed to reach significance for hearing impairment (odds ratio 1.73, 95% CI 0.83, 3.61).

Pless et al used data from the 1958 British Birth cohort to examine the relationship between sensory deficit and road traffic injuries. They similarly found that boys aged 7-11 years with a sensory deficit had a significantly raised odds ratio for traffic injuries (odds ratio 1.54, 95% CI 1.1, 2.1) (Pless et al 1989a). A recent Greek case control study using 144 children aged 5-14 years attending an emergency department for unintentional injury as the cases, and one hospital and one community control matched on age and sex, examined the association between hearing acuity and injury occurrence (Petridou et al 1995). The hearing acuity was measured and all children had a tympanogram performed. The results demonstrated no association with reduced hearing acuity, but a significant association with auditory imbalance (the absolute difference in auditory acuity between the two ears in decibels). Therefore children with a unilateral hearing loss were at increased risk from unintentional injury. A wide range of injuries was included in this study, not only injuries in which a hearing loss may provide a plausible explanation for the injury. Also the definition of hearing impairment was an increase in threshold of 5 decibels or more, consequently, extremely minor hearing losses will have been detected which may be insignificant in terms of increasing injury risk. These two factors may explain the inconsistency between these results and those previously found by Roberts and Norton, and Pless and coUeagues.

Previous work has also demonstrated that children with epilepsy are at an increased risk of drowning injuries (Kemp and Sibert 1993) and that children with a learning disability have an incidence of unintentional injury which is twice that of children without a learning disability (Williams 1973).

1.1.3.8 Ethnicity

The issue of ethnicity and childhood injury has only received a small amount of attention in the published literature. One study in Bradford found bums and scalds to be more common in children from the New Commonwealth, in those living in overcrowded conditions, as well as in families in lower socioeconomic groups. Using stepwise linear regression, ethnicity accounted for the largest part of the variance, and overcrowding and socioeconomic group were no longer associated with bums and scalds. This finding has not been replicated by any other studies so far (Learmonth 1979). Alwash and McCarthy studied 400 children presenting to an inner London Accident and Emergency Department. They found that ethnicity was not associated with injury after adjusting for social disadvantage (Alwash and McCarthy 1988). Lawson and Edwards studied child pedestrian casualties in Birmingham and found a higher pedestrian injury rate, both for fatal and non-fatal injuries amongst Asian children in the 1-4 and 5-9 year age groups (Lawson and Edwards 1991). Asian families were found to be more likely to live in areas with high traffic volumes, high levels of pedestrian activity, on street parking, narrow streets and a lack of play areas. An analysis of variance, however, demonstrated that the most important contributors to the likelihood of pedestrian injury were the age of the casualty and the type of road on which the injury occurred, not ethnicity. This again suggests that factors other than ethnicity are more important in determining injury occurrence.

1.1.3.9 Previous unintentional injury

Several studies have demonstrated that some children have a significantly increased risk of unintentional injury over a period of time compared with other children. Manheimer and coUeagues undertook a cohort study of 8,874 children aged 4-18 years enroUed in a pre-paid health plan over a 15 year period in the USA (Manheimer et al 1966). They used a mixture of retrospective and prospective data collection, so that data were available for at least one of the following 4 year periods; birth to 3 years, 4-7 years, 8-11 years and 12-15 years.

A sub-sample of children was checked to assess use of medical facilities outside the local area. More than 2% of the study population had attended 3 other centres, hence data from these centres were included in the analysis. Mothers of children with no entries in their medical records for one year were contacted to determine the extent of usage of the health care plan facilities. Any injury attendances outside of the health care plan (fewer than 3% of all children had such attendances) were included in the study. Finally, cross checks were made with an injury reporting program running in two adjacent counties and any attendances (recorded for 1% of the study population) were included in the study.

Injury rates were calculated according to the age of the child at the time of injury. Twenty five percent of the children (584) had more than one unintentional injury over the four year period. Comparisons of the observed distribution of number of injuries with that expected if a uniform distribution of risk existed, revealed that the accident rate for children with a previous injury was consistently higher than that for children with no previous injury. This relationship was found for both sexes, all age groups and for differing racial groups.

Use of an index of injury severity (a severe injury was defined as requiring three or more outpatient department attendances or hospitalisation), demonstrated a similar distribution of injury severity among injury repeaters and non-repeaters, suggesting that predisposition to seek medical attention was not confounding the relationship between previous and fiiture injuries.

The Oxford Record Linkage study, with data on all children aged under 5 bom between 1971 and 1973 in Oxfordshire or Berkshire, provided the database of hospital admissions for a cohort study testing the hypothesis that some children have a consistently high risk of unintentional injury (Eminson et al 1986). First and second injury rates were calculated using the number of person years at risk as the denominator. For second injury rates, children were at risk from the date of the first injury until the 2nd, death or age 5, whichever event occurred soonest. As the first injury rate will include children who go on to have a second injury, a non-repeater rate (ie those children not having a further injury) was also calculated. Comparisons were then made of first and second injury rates among repeaters, and first injury rates among repeaters and non- repeaters.

Second injury rates were significantly higher than non-repeater injury rates and significantly higher than first injury rates in repeaters for both males and females. Overall, children who had had one hospital admission following unintentional injury were found to have approximately a doubling of risk of a repeat unintentional injury admission than children with no history of admission. The first injury rate in repeaters was also significantly higher than in non-repeaters. The findings of this study suggest that some children are at a persistently higher risk of unintentional injury requiring admission.

The relationship between previous medically attended unintentional injury and fiiture injury has been examiner by Bijur et al using data from the 1970 British Birth Cohort (Bijur et al 1988a). Approximately 13,000 children bom one week in April in 1970 were followed up at 5 years and 10 years of age with parental interviews by health vishors. Data were available on 10,394 children at both 5 and 10 years of age. Details concerning unintentional injuries where medical attention was sought in the previous 5 years were obtained at interview. A series of variables were selected as possible predictors of unintentional injuries and data were collected on these variables during the interviews. They included sex, height, aggression, over-activity and neurotic behaviour (measured by the Rutter Child Behaviour Questionnaire), mother's age, marital status, mother's psychological status (measured by the Matemal Malaise Inventory), social class, number of older and younger sibUngs and number of household moves between 1970 and 1975.

During the first 5 years of life, 12.2% (1268) of the children experienced more than one medically attended unintentional injury, and during the next 5 years of life 12.9% (1344) children experienced more than one medically attended unintentional injury. A significant association was found between injuries during the first 5 years of life and injuries between the ages of 5 and 10 years. Children who had 3 or more injuries in the first 5 years of life had a relative risk of 5.9 (95% CI 4.4, 8.8) of 3 or more injuries in the next 5 years of life when compared to children without any injuries in their first 5 years. However, despite the high relative risk, the number of children having 3 or more injuries in the first 5 years of life who went on to have 3 or more injuries in the next five years of life was only 51 out of the total cohort of 10,394 (0.5%). When hospital admission was used as the outcome measure, children admitted to hospital once or more during the first 5 years of life were 2.5 times (95% CI 2.0, 3.3) more Ukely to be admitted during the next 5 years of life as those with no previous hospital admissions. Again the actual number of children who fell into this category was small, only 58 out of the total cohort of 10,394.

Six of the variables were found to predict injuries between 5 and 10 years of age; number of previous injuries, male sex, aggression, age of mother, number of younger siblings, and number of older siblings. A high risk group of children was identified as those with 3 or more prior injuries, male sex, above 90th percentile on the aggression scale, who had mothers aged 20-24 years and one older sibling. These children were predicted to have an unintentional injury rate of 139 accidents per l(X) children over the next 5 years. This rate was 10 times higher than for the group of children identified as being of low risk; namely those with no previous injuries, girls, those with aggression scores less than the 25th percentile on the scale, those with mothers aged 30-34 and 2 younger siblings. The authors do not present data on the number of children falling into this high risk group, but the number is likely to be smaU, as only 360 children had a history of 3 or more injuries in the first 5 years of life, before any of the other variables are taken into account. The authors suggest that identifying a high risk group of children may be useful for targeting injury prevention interventions, but do not estimate the sensitivity, specificity or predictive value of such factors (other than previous injury) for identifying children at high risk of injury.

The final study addressing repetition of hospital admission for a childhood unintentional injury once again uses data from the Oxford Record Linkage Study (SeUar et al 1991). Sellar and coUeagues used the records of 19,427 chUdren aged 5 years and under admitted to hospital between 1976 and 1985, for a prospective study of hospital admissions for unintentional injury in six of the eight health districts in the Oxford Regional Health Authority. Each child with an index admission between 1976 and 1985 (17,724 children from the total 19,427 had a first non fatal injury admission between 1976 and 1985) was followed up by record linkage for one year from the date of their first admission. Each child with an index admission between 1976 and 1981 (10,905 children) were followed up for five years from the date of their first admission. Repeated admissions within 28 days of the first admission were excluded to ensure that multiple admissions for the same accident were only counted once.

Over the one year foUow up period, 97.3% (17,254) of children admitted for their first unintentional injury, had no further admissions for unintentional injury, 2.5% had 2 admissions for unintentional injury (448) and 0.11% had 3 or more admissions (22). Sixteen of the 10,905 chUdren with an index admission between 1976 and 1981 died during that admission, therefore 10,889 were followed up for a five year period. Of these, 926 (8.5%) had at least one fijrther admission in the subsequent 5 years. The data on children followed up for one year was also used to test the hypothesis that specific injury types predict the same injury type in the future. Injuries were divided into bums, poisonings or other injuries. Children who had a first admission for poisoning were significantly more likely than others to have a poisoning on their second admission. A similar picture was found for bums. The authors point out that the number of children with multiple admissions is small (8.5% over a 5 year period), but suggest that prevention should be targeted at those who have had at least one admission for unintentional injury.

In summary, previous work has demonstrated that medically attended unintentional injuries predict future medically attended injuries, that hospital admission for unintentional injury predicts future hospital admission for unintentional injury, that admissions and attendances at hospital predict fiiture admissions and attendances, and that admissions for bums and poisonings predict fiiture admissions for those common injuries. As yet the relationship between accident and emergency department attendances and fijture hospital admission for childhood unintentional injury remains to be investigated.

The first study presented in this thesis examines the relationship between accident and emergency department attendance and hospital admission for unintentional injury in chUdren under five years of age. It discusses the transfer of information between the accident and emergency department and primary care following a chUd's attendance for injury, the utility of, and current health service response to, such information, and the evidence for the effectiveness of current primary care interventions made in response to information from accident and emergency departments.

1.1.3.10 Child behaviour

The 1970 British birth cohort has also been used to examine the relationship between chUd behaviour and medically attended unintentional injuries by Bijur at al (Bijur et al 1988b). The Rutter Child Behaviour Questionnaire was used to assess aggressive and overactive behaviour. Significant trends were found between both aggression and over-activity and decreasing socioeconomic status. Children living in overcrowded housing, in families that moved house frequently, or in famUies where the mother was employed full time had higher aggression and over-activity scores. A greater proportion of boys scored highly on both scales than girls. For boys a significant association was found between both types of behaviour and medicaUy attended injury (ambulatory care and hospital admission). Associations were present only between ambulatory care and both types of behaviour for girls. Adjusting for social factors did not alter the associations found for boys, but none of the associations remained significant for girls.

Pless and coUeagues, using the 1958 British Birth Cohort, found significantly raised odds ratios for road traffic injuries in boys aged 7 to 11 years rated as fidgety or highly sensitive by their teachers. (Pless et al 1989a). Matheney and coUeagues undertook a smaU study of twins assessing behavioural antecedents of injury. Those twins suffering more injuries had been described by their mothers as being more active, more temperamental and less attentive before the injuries occurred (Matheney et al 1971). Whilst the numbers were small in this study, the findings are supported by the large prospective studies undertaken by Bijur and coUeagues and Pless and coUeagues, which have found associations between child behaviour and unintentional injury.

1.2 A high risk or a whole population strategy to preventing unintentional injuries in childhood?

The review of the Uterature presented above iUustrates that it is possible to identify a group of chUdren who have increased risk of unintentional injury based on sociodemographic and risk factors for injury, and that it has repeatedly been suggested that injury prevention programmes should be targeted at such children (Bijur et al 1988a, Eminson et al 1986, Sellar et al 1991, Wadsworth et al 1983, Ohn et al 1995). Recent Government strategy has also recommended this approach (Department of Heahh 1993 a).

The utility of using such methods to identify high risk chUdren has been questioned for several reasons. Two of the studies discussed above have calculated the sensitivity and specificity of using some of these risk factors for the purpose of identifying chUdren at high risk of injury. Bijur and coUeagues (Bijur at al 1988a) calculated that having 3 or more injuries in the first 5 years of life had a sensitivity of 12.6% for predicting 3 or more injuries in the next five years of life, and a specificity of 96.9%. Therefore, only 12.6% of children having 3 or more injuries between the ages of 5 and 10 years will be identified in the first five years of Ufe by this method, and as such most of the chUdren having 3 or more injuries between ages 5 and 10 are not in the "high risk" group. The high specificity means that the majority of those not having 3 or more injuries between the ages of 5 and 10 years will be correctly identified as being "low risk" in the first 5 years of life. The positive predictive value can be calculated by going back to the original data, and is 14.2%. Therefore less than 1 in 6 of those identified as high risk in the first 5 years of Hfe will actuaUy go on to have 3 or more injuries in the next 5 years. The population attributable risk calculated from the original data is low, at 10.7%, so only one tenth of the incidence of repeated injuries (3 or more between ages 5 and 10 years) can be attributed to previous repeated injuries.

Bijur and coUeagues also calculated similar figures based on their study of child behaviour (Bijur et al 1988b). They found that high aggression scores and high over-activity scores simUarly had a low sensitivity for predicting hospitalisation for injury (19.9% and 15.7% respectively) and high specificities (87.1% and 89.1% respectively). As a result of these findings, several authors have questioned the utility of such an approach, and instead have recommended a population based approach. (Pless et al 1989a, Bijur et al 1988a, Bijur et al 1988b).

The argument for a population strategy for preventive disease has been eloquently made by Rose (Rose 1992). The theoretical basis of the argument is that disease and its risk factors usually exist as a continuum within populations such that the "diseased"and those at "high risk" merely represent the tail of the normal distribution of the population. The important implications of this argument are that:

a) high risk populations do not differ from low risk populations because they have many more people at high risk, but because the distribution of risk has shifted to the right

b) a large number of people exposed to a small risk may generate more cases of disease than a small number of people exposed to a high risk

c) prevention aimed at those at high risk will be limited in terms of reducing the burden of iU health, as most ill health occurs to those at lower risk, whereas a population strategy will impact on those at lesser risk amongst whom most cases of disease occur

d) the benefits of prevention will be greater to those at high risk than those at lesser risk, hence those in whom the majority of the burden of ill health occurs, will benefit little from prevention individually and may have little motivation to undertake preventive activity

e) on a population level, a small reduction in risk factors will lead to a large reduction in prevalence of disease, hence extreme changes in risk factors are not needed

f) the responsibility for prevention lies with each member of society, not just with those identified as high risk, because shifting the distribution of risk to the left will reduce the large number around the middle of the distribution who are at lesser risk, as well as reducing the small number in the tail of the distribution identified as being at high risk

These issues have not so far been discussed in detail with respect to childhood unintentional injuries. Bijur and colleagues have highlighted that although some children can be identified as being at very high risk, most injuries still occur in those at "low risk". (Bijur et al 1988a, Bijur et al 1988b). Therefore although injury prevention may have a large benefit for these individual high risk children, it will have relatively little impact on reducing the burden of injury related ill health in the childhood population. The implications of using a population approach for childhood unintentional injury prevention will be considered in the discussion relating to the second study presented in this thesis.

A fiirther problem in using risk factors to identify children at high risk of injury in order to target injury prevention programmes, is that the relationship between risk of injury and compliance with, and hence effectiveness of, an injury prevention programme is not clear. For a population approach to be effective those at lesser risk, as weU as those at high risk, must comply with the intervention. Few studies so far have addressed this issue. Eichelberger and colleagues undertook a telephone survey of 404 parents in Washington, USA and found that a greater proportion of parents from ethnic minority groups, young parents, parents with 3 or more chUdren and those from lower socioeconomic groups expressed interest in safety information (Eichelberger et al 1990). Roberts in a study in New Zealand found parents from the most disadvantaged socioeconomic group, whose children were at greatest risk of pedestrian injury, were least likely to respond to a petition caUing for road safety measures (Roberts 1995a). In terms of primary care based injury prevention interventions, studies addressing the risk factor status of families complying with interventions are needed.

The population approach is a feasible alternative to targeting injury prevention in primary care. The Fourth National Morbidity Study using data from 60 general practices across England and Wales demonstrated that 100% of children aged under 5 years consulted a practice nurse or general practitioner at least once a year (Royal College of General Practitioners 1995). This being so, there is the possibility for injury prevention in primary care to use a population approach, at least for children aged under 5 years. The repeated contacts that the primary health care team has with chUdren and their parents, routinely and opportunistically, both at home and in the surgery, provide opportunities for injury prevention. The second study presented in this thesis addresses the question of whether primary care based injury prevention should be undertaken using a population approach or targeted at children at high risk of unintentional injury. The implications for injury prevention in primary care of using both approaches are discussed.

1.3 The role of the primary health care team

The role of the primary health care team in childhood unintentional injury prevention has received relatively little attention in the published literature so far. Much of the published work in this area focuses on the roles of individual team members rather than on the team as a whole (Laidman 1987 , Levene 1992, Lowe 1989, Ehiri and Watt 1995, Child Accident Prevention Trust 1991b, Carter et al 1992, Greig 1987, Carter and Jones 1993a, Carter et al 1995, Leveque at al 1995, Bass et al 1993, Roberts et al 1996, Morgan and Carter 1996a, Coombes 1991, Colver et al 1982, Kendrick 1994b, Morgan and Carter 1996b). The role of the health visitor has been discussed most widely (Laidman 1987, Levene 1992, Lowe 1989, Ehiri and Watt 1995, Child Accident Prevention Tmst 1991b, Carter et al 1992, Roberts et al 1996, Morgan and Carter 1996a, Coombes 1991, Colver et al 1982, Morgan and Carter 1996b).

1.3.1 The role of the health visitor in childhood unintentional injury prevention

Educating parents (and less often children) about child safety is the most frequently mentioned role of the health visitor (Laidman 1987, Levene 1992, Lowe 1989, Ehiri and Watt 1995, Child Accident Prevention Trust 1991b, Carter et al 1992, Coombes 1991, Colver et al 1982). This may be undertaken with individual famiUes opportunistically in response to dangerous circumstances, observed hazards in the home or foUowing an unintentional injury (Department of Health 1993a, Laidman 1987, Levene 1992, Lowe 1989, Ehiri and Watt 1995, ChUd Accident Prevention Tmst 1991b, Carter et al 1992, Coombes 1991, Colver et al 1982). It may be undertaken routinely as part of child health surveiUance programmes giving anticipatory safety advice based on child development (Department of Health, Laidman 1987, Levene 1992, Lowe 1989, Ehiri and Watt 1995, ChUd Accident Prevention Trust 1991b, Carter et al 1992, Kendrick 1994b, Hall 1996), or with 'mdividual families using a systematic stmctured approach based on identifying hazards in the home (Department of Health 1993 a, Laidman 1987, Levene 1992, Lowe 1989, Carter et al 1992, Colver et al 1982, Kendrick 1994b). Education may also be provided in group settings such as mothers and toddler groups, women's groups or ante-natal groups (Laidman 1987, Levene 1992, Lowe 1989, Carter et al 1992, Child Accident Prevention Tmst 1993a). The educational model most commonly discussed in this context is the preventive model which focuses on the individual, attempting to persuade individual parents (and / or children) to change their behaviour or their environment (Tones et al 1990). Other health education models, such as the self-empowerment or radical-political models, are only rarely discussed (Levene 1992, Child Accident Prevention Tmst 1991b, Kendrick 1994b, Towner 1995). Similarly the use of educational approaches in conjunction with engineering or legislative approaches is rarely discussed.

The health visitor's involvement with safety equipment provision is also frequently mentioned as one of their roles in injury prevention, either in establishing or accessing safety equipment loan or low cost schemes, advising on financial help avaUable for the purchase of safety equipment, being aware of local availability of new or secondhand equipment or of local services for fitting safety equipment (Departtnent of Health 1993a, Kendrick 1994b, Carter et al 1992, Laidman 1987, Levene 1992, Lowe 1989 , Coombes 1991, Child Accident Prevention Tmst 1991c).

Liaison between paediatric accident and emergency departments and primary care regarding chUdren presenting to hospital with unintentional injuries is also seen as one of the roles of health visiting, either in undertaking the liaison work or in acting upon information provided by the A & E departments (Department of Health 1993a, Kendrick 1994b, Morgan and Carter 1996b, Laidman 1987, Levene 1992, ChUd Accident Prevention Tmst 1991b, Carter et al 1992, Kay 1989, Reynolds 1996). The largest study in this area, a national survey of 436 liaison nurses and health visitors, described the occupational characteristics and the process of liaison. It highlighted the importance of collecting and transmitting information on cause of injury, injury type, treatment given and details of previous injuries. The provision of post accident follow up visits by community staff in response to notifications was discussed (Morgan and Carter 1996b). The paucity of existing evidence concerning the effectiveness of post accident follow up visits, alternative responses to notification and other uses of the information collected by liaison staff were not discussed in detail. Reports of other existing schemes (Laidman 1987, Kay 1989, Reynolds 1996) fail to adequately describe the content of the information transmitted to primary care, how the team member decides whether or not to act on the information and the effectiveness of any action taken as a result of the information.

Post accident follow-up visits have been suggested as an appropriate health visiting response to A & E notifications of injured children, (Morgan and Carter 1996a, Laidman 1987, Levene 1992, Lowe 1989, ChUd Accident Prevention Tmst 1991b, Kay 1989, Reynolds 1996), ahhough it is frequently acknowledged that such visits may be difficult for both the parents and the health visitor (Coombes 1991, Laidman 1987, Kay 1989, Reynolds 1996, Child Accident Prevention Tmst 1991b) and there is, at present, a lack of high quality published studies assessing their effectiveness. These issues will be considered in detail in the discussion of the results of the first study presented in this thesis.

Participation in local healthy aUiances, either formally through local child injury prevention groups (Department of Heahh 1993a, Kendrick 1994b, Levene 1992, Carter et al 1992, ChUd Accident Prevention Tmst 1991c), or informally through networking and collaborative working with relevant agencies on community or individual family safety issues (Department of Health 1993a, Kendrick 1994b, Levene 1992, Carter et al 1992), has more recently been suggested as a role for health visitors. Similarly the coUection and collation of childhood injury data at a local level has been highlighted as one of the possible roles for heahh visitors (Kendrick 1994b, Laidman 1987, Levene 1992, Child Accident Prevention Tmst 1991b), including paediatric liaison and community heahh visitors. The role of health visitors in using poUtical means in injury prevention such as lobbying or campaigning has received Uttle attention so far (Ehiri and Watt 1995, Kendrick 1994b) FinaUy it has been suggested that health visitors should act as role models in injury prevention within their communities (Levene 1992), for example by being seen to wear cycle helmets, not examining or weighing babies on high surfaces or not using baby walkers for their children.

1.3.2 The role of the general practitioner in chUdhood unintentional injury prevention

The role of the general practitioner in the UK has received less attention than that of the health visitor (Department of Heahh 1993a, Kendrick 1994b, Greig 1987, Carter and Jones, Carter et al 1995, Agass et al 1990, Marsh et al 1995). A national survey of general practitioners in the United Kingdom illustrated that more than three quarters of respondents (77%) considered injury prevention to be part of their role (Carter et al 1995). The roles most frequently described for general practitioners include giving advice to parents after a childhood injury (Department of Health 1993a, Kendrick 1994b, Grieg, Carter et al 1995, Carter and Jones 1993a), giving safety advice as part of a child health surveillance programme (Department of Heahh 1993 a, Kendrick 1994b, Greig 1987, Carter and Jones 1993a, Carter et al 1995), recommending safety equipment

(Department of Health 1993 a, Kendrick 1994b, Carter and Jones 1993 a, Carter et al 1995), advising on hazards in the home on home visits (Department of Health 1993a, Kendrick 1994b, Carter and Jones 1993a, Carter et al 1995) and providing educational Uterature (Department of Health 1993a, Carter and Jones 1993 a, Carter et al 1995).

Other roles discussed in the literature include the collection of data on childhood injuries presenting to primary care (Department of Health 1993 a, Kendrick 1994b, Greig 1987, Carter and Jones 1993a, Agass et al 1990, Marsh et al 1995), the tertiary prevention of injuries by treating acute injuries in primary care (Greig 1987, Carter and Jones 1993a, Carter et al 1995, Kendrick 1994b) and liaison between general practitioners and health visitors or other members of the primary health care team (Carter and Jones 1993a, Carter et al 1995, Kendrick 1994b). Roles less frequently discussed include identifying high risk groups of children for targeting injury prevention (Greig 1987), advising on the safe disposal of unwanted medicines (Department of Health 1993 a), membership of a local child accident prevention group (Carter et al 1995), educating other members of the primary health care team about injury prevention (Greig 1987), advising local communities on safety and first aid (Department of Health 1993a) and, more recently, facilitating other members of the team to undertake injury prevention (Kendrick 1994b).

The educational models used by primary care physicians in the United Kingdom have not been discussed in detaU in any of the literature published so far, but most of the literature concentrates on giving advice to individual parents regarding safety, hazards in the home or the acquisition of safety equipment, so focussing on the preventive model of health education. There is rarely emphasis on combining educational approaches with engineering or legislative approaches (Kendrick 1994b, Towner 1995).

1.3.3 The role of the practice nurse in chUdhood unintentional injury prevention

The role of the practice nurse in childhood unintentional injury prevention has received little attention. There have been no published studies primarily addressing this issue. Several studies concerning the role of the practice nurse in general have considered some areas of injury prevention (Peter 1993, Hibble 1995, Mourin 1980, Powell 1984, Greenfield et al 1987), either providing first aid treatment for injuries (Peter 1993, Hibble 1995, Mourin 1980, Powell 1984), or assisting at resuscitation (Greenfield et al 1987). The potentially wider role of the practice nurse, for example in providing advice at injury consultations (Kendrick 1994b), age specific advice at immunisations (Kendrick 1994b) and the collection and collation of data on injury presenting to the primary health care team (Greig 1987, Kendrick 1994b), has rarely been explored. The Health of the Nation Key Area Handbook on Accidents makes suggestions concerning the role of the primary health care team, however no specific mention is made of the role of the practice nurse in childhood injury prevention (Department of Heahh 1993 a). Similarly no mention is made of the practice nurse's role in childhood injury prevention in the document describing the contribution of nurses, midwives and health visitors to the Heahh of the Nation (Department of Heahh 1993b). Other members of the primary health care team such as administrative, clerical or managerial staff, district nurses, midwives, dispensing staff or other members of the team have rarely received any consideration (Department of Health 1993b, Kendrick 1994b).

1.3.4 Opportunities for injury prevention in a primary care setting

The nature and organisation of primary health care provision in the United Kingdom has resulted in both the service and the service providers possessing characteristics which are important in terms of the opportunities arising for injury prevention. These are listed below:

(I) frequent repeated contacts between primary health care team members and families with children (Royal College of General Practitioners et al 1995)

(ii) provision of minor injury treatment services by the majority of primary health care teams (Carter et al 1995) which are extensively used by their patient populations (Agass et al 1990, Marsh et al 1995, Steele et al 1994)

(iii) a high rate of home visiting by general practitioners, heahh visitors, midwives and district nurses (Marsh 1991)

(iii) a stmctured chUd health surveillance programme usually delivered by a variety of team members (Hall 1996)

(iv) the provision of continuing care to famUies, often over many years, and several generations, from a team whose membership is often relatively stable over a long period of time (Tudor-Hart 1988)

(v) extensive knowledge of individual families and often experience of dealing with sensitive, difficult and personal issues with family members (Laidman 1987, Levene 1992)

(vi) good knowledge of local geography, local facUities, amenities and communities (Tudor-Hart 1988)

(vii) residence of at least some primary health care team members in or close to the practice area

(viii) access to local communities through existing groups such as mother and toddler groups, antenatal groups, patient participation groups, pubUc annual reports etc. (Laidman 1987, Levene 1992, Kendrick 1994b, Tudor-Hart 1988)

(ix) facilities for displaying information, showing and distributing safety equipment, mnning local groups

(x) access to a registered population (Tudor-Hart 1988)

These characteristics of primary health care provision place the primary health care team in a unique position to undertake chUdhood injury prevention. A variety of possible roles exist including;

(a) systematic stmctured anticipatory injury prevention education as part of the child heahh surveillance programme (Krassner 1984)

(b) opportunistic injury prevention education during routine consultations and during consultations for acute injury

(c) the provision of first aid advice during consultations for acute injury

(d) the identification of hazards in the home on home visiting and advice regarding reducing such hazards

(e) access to low cost safety equipment, safety equipment loan schemes, second hand equipment and information on financial help available for the purchase of equipment

(f) educating parent groups about injury prevention and first aid

(g) the collection of data on childhood injuries presenting to the primary health care team, referrals from paediatric liaison A & E health visitors and data from other sources such as school nurses

(h) the dissemination of data on childhood injuries to the local community via displays and exhibitions, armual reports, local parents groups

(I) the identification of local safety issues by the collection of injury data, and information from local parents groups, patient participation groups etc.

(j) lobbying and campaigning on local safety issues

(k) the establishment of local networks of individuals from agencies with a role in child injury prevention

(I) the continued support of families where children have suffered injury including the provision of educational and engineering measures to prevent future injury

(m) advice regarding the safe storage of medicines and disposal of unwanted medicine at the time of prescription and dispensing

(n) ensuring the safety of the surgery premises

(o) auditing injury prevention practice

(p) research on childhood unintentional injuries

1.3.5 Evidence of the effectiveness of primary health care team initiatives in reducing childhood unintentional injuries

The publication of systematic reviews in the field of childhood unintentional injury is a relatively new phenomenon. Over the last five years numerous reviews have been undertaken addressing this issue (Bass et al 1993, Roberts et al 1996, Towner et al 1993, Towner et al 1996, SpeUer et al 1995, Popay and Young 1993, Pless 1993, Kendrick and Marsh 1994), but few focus primarily on primary care interventions (Bass et al 1993, Roberts et al 1996).

Bass and coUeagues (Bass et al 1993) undertook a systematic Medline search of the English language literature, combined with asking the seven review panellists to contribute articles not identified by the literature search. The search covered the years 1964-1991. To meet the inclusion criteria articles had to be an original report covering injury prevention counselhng in a primary care setting. Each article was independently reviewed by two panellists and conflicts between reviewers were resolved by reference to the coordinator of the reviewing group in consultation with reviewers with expertise in epidemiology. Studies were grouped by quality of evidence using the US Preventive Services Task Force criteria. A rating scale was also developed to compare articles within each quality category. This scale comprised a summed total of scores obtained on each of six study characteristics; temporality, sampling technique, use of a control group, randomisation, blinding and outcome variables used. If it was not possible to determine from the article if the study characteristic was present, the study was scored as if that characteristic was absent. If the outcome variable was reported behavioural change, rather than observed behavioural change, the study was scored as if the outcome variable was a change in knowledge rather than a change in behaviour, to minimise the effect of over reporting of safe behaviour. A meta-analysis was not undertaken as the studies varied widely in study design, injury types and statistical methodology, hence they were considered too heterogeneous to sensibly combine in a meta-analysis.

A total of 65 studies were identified over the 27 year period. Of these, twenty one met the inclusion criteria. Twenty of these studies were prospective and seventeen evaluated physician counselling of parents. The seven highest scoring studies in terms of quality were randomised controlled trials (Kelly et al 1987, Dershewitz and WUliamson 1977, Dershewitz 1979, Thomas et al 1984, Miller and Pless 1977, Scherz 1976, Katcher et al 1989). Five demonstrated poshive outcomes (KeUy et al 1987, Dershewitz 1979, Thomas et al 1984, Scherz 1976, Katcher et al 1989). Physicians were involved in providing parent counselling in two of these studies (Kelly et al 1987, Scherz 1976). The positive outcomes demonstrated included increases in self reported safety behaviour (Kelly et al 1987, Dershewitz 1979, Scherz 1976 and Katcher et al 1989), reductions in observed hazards in the home (Kelly et al 1987), increased use of outlet covers (Dershewitz 1979) and decreased hot water temperature (Thomas et al 1984); as well as increased sales of child car seats (Scherz 1976) and improved recognition of household injury situations (Kelly et al 1987). None of these studies demonstrated reductions in injury frequency or severity. Most of these studies had small sample sizes (Kelly et al 1987, Dershewitz and Williamson 1977, Dershewitz 1979, Thomas et al 1984) and short follow up periods (Kelly et al 1987, Dershewitz and Williamson 1977, Dershewitz 1979, Scherz 1976, Katcher et al 1989) which will have limited their ability to demonstrate reductions in injury frequency.

Ten studies were controlled but not randomised, all of which included physician counselling and all of which demonstrated positive outcomes (Reisinger et al 1981, Kravitz 1973, Macknin et al 1987, Bass et al 1985, Kanthor 1976, Miller et al 1982, Alpert et al 1967, Guyer et al 1989, Bass et al 1991, Bass and Wilson 1964). Three studies in this group demonstrated reductions in injury frequency in terms of falls in infancy (Kravitz 1973), motor vehicle occupant injuries (Guyer et al 1989) and reductions in injury rates for aU injury types (Bass et al 1991). The important question to consider for each of these studies is the potential effect of selection bias due to lack of randomisation. The design of each of these studies will be considered in detail below.

Kravitz reports a comroUed study of the effectiveness of paediatrician office counselling on the incidence of falls from elevated surfaces in infancy (Kravitz 1973). The control group consisted of 336 infants (children in the first year of Ufe) seen in a paediatric private practice over a one year period. The intervention group consisted of 320 infants seen in the same practice over the subsequent year. No information is given on the sampUng technique used for either the intervention or control group. The intervention included paediatrician- delivered visual, oral and written instmctions on how to avoid faUs in infancy from high surfaces. All falls reported to the paediatrician prospectively over a one year period for each group were recorded. At the end of each year, each family in both groups was contacted to determine the incidence of non- reported falls retrospectively over the one year period.

Baseline data on socioeconomic status, matemal age, birth order of the infants and the character of the homes (undefined) was reported to be similar in both groups. To reduce the effect of recall bias and parental reluctance to report falls, analyses were conducted for both prospectively and retrospectively recorded falls. There was a significant difference in the incidence of first falls for both retrospectively and prospectively recorded falls, with a lower proportion of children in the intervention group having a first fall over the one year period.

Possible explanations for these findings, other than the effect of the intervention, include firstly the possibUity of a co-intervention occurring during the intervention period, as the control and intervention groups were studied in consecutive years, rather than during the same time period. A second possibility is that the intervention children selected for the study were at lower risk of falls, but this seems unlikely as socioeconomic status, matemal age, birth order and household character were similar across the two groups. A further possible explanation is that of differential reporting of falls, both prospectively and retrospectively, with intervention families being less likely to report a fall.

Guyer and colleagues report a community based intervention study (The Statewide ChUdhood Injury Prevention Program, SCIPP) in nine Massachusetts cities matched on demographic variables (population size and density, age composition, educational level, family income, housing characteristics, health service utilisation and paediatric health service characteristics) with five control communities (Guyer et al 1989). The total population in the intervention communities was 140,000 persons and 147,000 persons in the control communities.

Five interventions were undertaken in each community, aimed at reducing injuries in the under 5 year age group. The interventions included injury prevention counselling for parents delivered by paediatricians using the Framingham Safety Survey, household injury hazard identification through home safety inspections by specially trained staff, school and community bum prevention education, community wide promotion of a poison control telephone information service and public education about poison prevention and finally promotion of child car restraint use. Process measurements included the number of persons and households reached and materials distributed, as well as a telephone survey at the end of the study to estimate exposure to mterventions over the 2 year intervention period. Outcome measures included self reported safety behaviour and knowledge, medically attended injuries (defined as emergency room attendances, hospital admission or death) occurring at 23 hospitals that provided care for an estimated 93% of all paediatric injuries in the population.

Forty two percent of households in the intervention communities received at least one intervention. The resuhs of the study demonstrated a significant reduction in the frequency of motor vehicle occupant injuries in the intervention group, associated with an increased reported restraint use in the intervention group. No reduction in any other type of injury was demonstrated. Increased safety knowledge and self reported safety practices were found for bums and poisonings, but not for other types of injury. As a result of multiple interventions occurring over the same time period, it was not possible to determine which of the interventions produced the observed effect.

A further problem with the study was that although socioeconomic status in intervention and control communities was similar at the start of the study, by the end of the 22 month intervention period, the control group population had a higher proportion of Hispanic and low income famUies, in which one would expect a higher incidence of injuries. The results were adjusted for socioeconomic status, but it is possible that this adjustment did not adequately reflect all aspects of deprivation and race associated with increased injury rates in these groups, such as famUy support networks, child care practices and living environment. In such circumstances an intervention may appear effective, when in reality the observed difference can be attributed, or partiaUy attributed, to an increased frequency of the outcome in the control group, unrelated to the intervention.

Bass and colleagues attempted to minimise the effect of the change in socioeconomic status of the control group and to assess the effectiveness of the physician counselling within SCEPP by analysing the results for four suburban Massachusetts communities separately (Bass et al 1991). This was undertaken on the grounds that these commuruties did not experience a change in their socioeconomic status over the period of the study and that they had the greatest penetration of paediatric counselling (30% of children aged 0-5 years) and that this exceeded penetration levels for the other interventions (car passenger safety programme reached 17% of the intervention population, bum prevention reached 10%, poison control reached 1% of the population). The socioeconomic status of famiUes in the intervention and control communities were similar. The population aged 0-5 years in the intervention group was 2007 and 1828 in the control group.

The baseUne injury rate was higher in the intervention group than the control group, but both rates were low (196 and 131 per 10,000 child years respectively). A reduction in injury frequency of 15.3% was found in the intervention group and an increase in injury frequency of 47.7% in the control group. The relative risk of medically attended injury in the control group was 1.75 (95%CI 0.95, 3.19). Although this lends support to the hypothesis that physician counselling is associated with reductions in injury frequency, the effect of the other interventions cannot be completely eliminated. The lack of randomisation in this study could have introduced selection bias if the intervention communities were at lower risk of injury than the control group for reasons other than the intervention. The finding of a higher baseUne injury rate in the intervention group suggests this was not the case.

The use of only the suburban population in this analysis limits the generalisability of the findings. Not only are this group of families more likely to attend for preventive chUd health care (Marsh and Chanming 1986, Jarman et al 1988, Adjaye 1981, Zinkin and Cox 1976), but their compliance with injury prevention advice may differ from that of less advantaged families.

Roberts and coUeagues have undertaken the only other review to focus on primary care (Roberts et al 1996). This is a systematic review of the effectiveness of home visiting programmes in reducing childhood injury, both unintentional or intentional. The inclusion criteria were that studies had to have random or quasi-random assignment of participants to the intervention and control groups, the study intervention had to include one or more post-natal home visits and the outcomes of child injury either intentional or unintentional, had to be measured. A MedUne search was undertaken between 1966 and 1995 and an Embase search between 1975 and 1995. Hand searching of specific child abuse journals was undertaken. Authors of identified papers and experts in the subject were contacted for details of unpublished research.

The quality of the trials was assessed using Prendeville's criteria (randomisation, bUnding of observers and adequacy of concealment of allocation). Two assessors independently reviewed each article and the degree of agreement between the assessors was estimated by calculating kappa coefficients. Disagreements between reviewers were resolved by discussion between the reviewers. A meta-analysis was undertaken to estimate the pooled odds ratio and 95% confidence interval.

A total of 33 trials were identified in which there was random allocation of participants to a home visiting programme. Eleven of these trials also had outcome data on intentional or unintentional injury. Kappa coefficients for the agreement between the two assessors ranged from 0.51 for assessment of random allocation to 0.94 for concealment of allocation. Eight trials reported outcomes on unintentional injury. Five of these trials involved non professionals in delivering the home visiting service, one involved a nurse, one a social worker and one a combination of visits by a physician, nurse and a lay visitor. Six of the eight studies reported odds ratios of less than one, but in only one study was the odds ratio significantly different from unity. The majority of studies had small sample sizes and probably had insufficient power to demonstrate reductions in the incidence of injury. Combining the results to produce the pooled odds ratio demonstrated an overall positive effect of home visiting on childhood unintentional injury, with a pooled odds ratio of 0.74 (95%CI 0.60,0.92).

Although home visiting is an important component of health visiting in the UK, it is difficult to extrapolate the resuhs of this systematic review to the health visiting service for several reasons. Firstly the content of the home visit may differ between health visitors and non professionals, and none of the studies describe whether any injury prevention advice was given or if, for example, families were facilitated to obtain and use safety equipment. It is therefore difficult to know which aspect(s) of the intervention was (were) effective and consequently how best to implement the findings in practice. Secondly many of the studies included in this review described home visiting programmes targeted at families considered to be at high risk of a range of adverse child health outcomes, hence the ability to apply these resuhs to a universal home visiting service will be limited. As the delivery of a universal home visiting service by health visitors has significant resource impUcations, weU conducted studies of their effectiveness in this area are needed.

The other systematic reviews relating to childhood unintentional injury prevention do not specificaUy address the role of the primary health care team, but do support the findings of the review by Bass and coUeagues (Bass et al 1993) that primary care based injury prevention programmes can be effective in increasing knowledge, reducing hazards in the home and mcreasing safe behaviour, including safety equipment possession and use (Towner et al 1993, Towner et al 1996, Speller et al 1995, Popay and Young 1993, Pless 1993, Kendrick and Marsh 1994). The only recent study demonstrating reductions in injury frequency resulting from a primary care based intervention which is not included in the reviews by Bass or Roberts is that by Kmg and colleagues in South Africa (Kmg et al 1994). In a controlled, but non randomised, study evaluating a primary care based programme to raise awareness of paraffin ingestion and to distribute child resistant closures for paraffin containers, a forty seven percent reduction in mean monthly incidence rate of paraffin ingestion was demonstrated in the intervention group and no reduction in the control group.

The conclusion from these studies is that there is much evidence that physician counseUing can increase self reported and observed safety behaviour. As regards reducing injury frequency there is only a small amount of evidence that such counselling can reduce injury rates, and only two studies so far have demonstrated such a reduction resulting from injury prevention counseUing in a primary care setting. However, very few methodologicaUy high quality studies have been conducted in this area with a sample size which allows sufficient power to demonstrate reductions in injury frequency, with an appropriate follow up period, with adequately described interventions aUowing replication and with high levels of penetration of the intervention. Such studies are required to address this important area.

1.4 Main findings from the review of the literature and development of the objectives of the research

The review of the literature presented above clearly demonstrates that unintentional injuries are an important child health problem. Many factors have been identified which are associated with a higher risk of injury in childhood, including previous injury. At present, there is a lack of evidence regarding the most appropriate use of information regarding injury occurrence currently being communicated between secondary and primary care. The first study presented in this thesis therefore addresses the question of whether children who have attended the accident and emergency department are at greater risk of fiiture injury and discusses the implications of the findings for injury prevention in primary care.

Although many risk factors have been identified for chUdhood unintentional injury, there is a lack of information concerning the best preventive strategy for primary care injury prevention programmes in terms of a high risk or population approach. The second study presented in this thesis examines the feasibility of using a range of risk factors to identify a group of children at high risk of injury in order to target prevention at such children. It discusses the implications for injury prevention in primary care of using both the high risk and population approaches.

There is a growing body of literature on the role of the primary health care team, particulariy the health visitor, in injury prevention. If the primary health care team is to develop its' role in injury prevention there is a need for an assessment of the knowledge, attitudes towards and current practice in injury prevention of general practitioners, practice nurses and heahh visitors, in order that injury prevention programmes can be designed which are appropriate to those working in primary care. The third study presented in this thesis describes a survey of general practitioners, practice nurses and health visitors examining knowledge, attitudes towards and current practices in chUdhood injury prevention. It considers the implications of the findings for injury prevention in primary care, including discussing the barriers which will need to be overcome if injury prevention practice is to become more effective.

Evidence for the effectiveness of primary care injury prevention interventions is needed if primary health care teams are to develop their role in childhood injury prevention. There is evidence that primary care interventions can be effective in increasing both self reported and observed safety behaviour and in reducing hazards in the home. At present there is a lack of evidence regarding the effectiveness of primary care injury prevention interventions in terms of reducing injury frequency or severity, but the majority of studies in this area have significant methodological flaws which severely limit their potential for demonstrating such outcomes. Further large randomised studies with an adequate follow up period, evaluating both the process of the intervention and the outcomes in terms of a range of measures of injury occurrence including injury severity are needed.

Chapter 2

The relationship between accident and emergency department attendance and future hospital admission following unintentional injury

2. The relationship between accident and emergency department attendance for unintentional injury and future hospital admission following unintentional injury

2.1 Objective

To examine the relationship between accident and emergency department (A&E) attendances for unintentional injury and fijture admission for unintentional injury in children under 5 years.

2.2 Method

2.2.1 Study Design

A case-control design was chosen to examine the relationship between A&E attendance and hospital admission injuries in preference to a cohort study, as admission to hospital foUowing unintentional injury in childhood is a relatively rare event. Between one in five (Sibert et al 1981, Walsh et al 1996) and one in six (Department of Trade and Industry 1996) children attend an A&E Department foUowing unintentional injury at least once a year. Of those attendances, between 5% and 10% are admitted to hospital (Department of Trade and Industry 1996, Walsh et al 1996). Therefore the least conservative estimate is that 2% of children are admitted following unintentional injury annually. Based on this estimate, a cohort study would require a minimum of 1992 chUdren to be followed up for one year to detect a relative risk of admission of at least 2, with 80% power and at the 5% significance level. Case control designs are however useful for studying rare outcomes as the study commences with the cases with the outcome in question, consequently they require a smaUer sample size to detect a similar odds ratio with the same power and significance levels. Based on a matching ratio of one to one, it is estimated that a minimum of 282 case control pairs are required to test the above hypothesis with a power of 80%, a significance level of 5% and an estimated exposure rate (i.e. A&E attendance) of 16% per year (Department of Trade and Industry 1996). WhUst case control studies are useful for studying rare outcomes, can be undertaken over a shorter time period and require smaller sample sizes than cohort studies, there are opportunities for bias in assessing exposure and in the choice of controls (Sackett et al 1991, Coughlin 1990, Roberts 1995b). These methodological issues wiU be discussed in detail below.

2.2.2 Study population

The population chosen for this study comprised children aged under 5 years resident within the Nottingham Health Authority boundary. The study population was limited to children aged under 5 years because health visitors currently provide injury prevention services to this group of children, and it was envisaged that the results of this study would inform decisions regarding notification of unintentional injury attendances to health visitors working in the community and the action taken by health visitors on receipt of such notification.

Nottingham Health District has only one paediatric A&E Department situated in the centre of the District, which serves the population of the entire health district. For this reason the study population was lïunited to children resident within the Health Authority boundary.

2.2.3 **Definition** of cases

Cases were defined as children aged under 5 years, resident within Nottingham Health Authority boundary, registered with a general practitioner and on the Nottingham Family Health Services Authority register since birth (who therefore were assumed not to have moved out of the Nottingham Health Authority area since birth) who had their admission for unintentional injury during 1990 to one of the Nottingham Hospitals, whether via the A&E Department or whether admitted directly to a ward by the general practitioner. The first admission for unintentional injury has been used as the outcome measure, as previous work has demonstrated that children who have a history of admission for unintentional injury are at greater risk of fiiture admissions for unintentional injury (Bijur et al 1988a, Eminson et al 1986, Sellar et al 1991). Consequently previous admission for unimtentional injury could act as a confounding variable as it is associated with the outcome (i.e. admission) and could also be associated with the exposure (i.e. attendance).

Cases were identified from the Patient Administration System of Nottingham Health Authority. All children not residing within in the Nottingham Health Authority boundary were excluded. Those children who were registered with a general practitioner on the Nottingham FamUy Health Services Authority Ust after the age of 3 months were also excluded. (Three months was chosen as the primary care child health surveiUance programme in Nottingham comprises a check between 6 and 8 weeks undertaken by the general practitioner and immunisation at 8 and 12 weeks, thereby providing three opportunities for the child to be registered with the general practitioner by 12 weeks of age. It was therefore assumed that the majority of chUdren resident within Nottingham Health Authority boundary from birth would be registered by 3 months of age. Children with a Nottingham Health Authority address, but not registered with a general practitioner on the Nottingham FHSA list were excluded, as their length of residence in the Authority area was unknown.

The Abbreviated Injury Scale was used to calculate the Injury Severity Score (ISS) which was used as the measure of injury severity for aU admission and attendance injuries amongst the cases and controls. The ISS was chosen as a suitable scoring system as this has previously been validated and used for injuries in childhood (Association for the advancement of automative medicine 1990, Wesson et al 1987, Zohie et al 1983, Yates 1990, Walsh and Jarvis 1992, Walsh et al 1996).

2.2.4 Definition of controls

Controls were defined as children aged under 5, resident within Nottingham Health Authority boundary, registered with a general practitioner on the Nottingham FHSA Ust from age 3 months, matched on sex and date of birth with each case. The first child on the FHSA Ust, of the same sex and date of birth was taken. If this was not possible, the child of the same sex with the date of birth closest to the case was chosen. Any controls who had been admitted to a Nottingham hospital following an unintentional mjury were identified from the A&E module of the Patient Administration System and were excluded.

Community controls were chosen in preference to hospital controls as children admitted to hospital are a highly selected group of children who may be more, or less likely to have had previous attendances at the A&E Department for unmtentional injury than children living in the commurity. For example, hospital admission occurs more frequently in children living in socioeconomically disadvantaged circumstances (Spencer et al 1993). Some studies have found that such children are also at greater risk of attendance at A&E foUowing unintentional injury (Alwash and McCarthy 1988, Constantinides 1988, Walsh and Jarvis 1992, Walsh et al 1996). Hospital controls may also spend more time in hospital and spend less time in conditions where an injury is more likely, which could lead to over estimation of the odds ratio. Children with chronic disease are more likely to be admitted to hospital for their chronic disease but depending on the condition may be more or less Ukely to have unintentional injuries. For example, children with hearing or visual impairment or epilepsy may be at greater risk of unintentional ˙mjury (Pless et al 1989, Roberts and Norton 1995, Kemp and Sibert 1993). Consequently hospital controls may represent a group of children whose risk of A&E Department attendance could differ significantly from that of the cases as a result of the conditions or diseases resulting in their hospitalisation. Community controls were therefore chosen in order to minimise such selection bias.

2.2.5 Matching

The controls were matched with the cases on age and sex to control for the effects of confounding by these variables (Bland and Altman 1994) The first child of the same sex and with the same date of birth as the case, fulfilling the criteria above was chosen as the control from the FHSA register. One to one matching was chosen because there were sufficient cases to fiilfil the requirements of the sample size calculation.

2.2.6 Measurement of exposure

The exposure being measured in this study is A&E department attendance for unintentional injury prior to the date of the cases first admission for unintentional injury. Exposure status was measured by searching the A&E module of the Patient Administration System of Nottingham Health Authority for each case and control based on first name, last name, date of birth, sex, address and postcode.

All attendances prior to the date of the cases first admission for unintentional injury were recorded. All A&E attendances recorded on the Patient Administration System were coded as unintentional injury attendances or medical attendances at the A&E department. Therefore it was possible to select out only those attendances for unintentional injury. The details recorded on the Patient Administration System for each unintentional injury attendance included date, time of attendance, whether it was a road traffic injury, the injury incurred, treatment given, and disposal details i.e. admission, discharge, referral back to GP, or to an outpatients department. The mechanism of injury, e.g. fall, was not recorded and the location was not recorded, other than for road traffic injuries. The A&E manual records were examined in order to assign scores for injury severity. For any records which could not be found at the first attempt, two fiirther attempts were made to trace them over the period of one month. This included obtaining records from record stores outside the hospital, from consultant's secretaries and from out patient department clinics.

A frequent source of bias in case control studies arises from measuring exposure, when the exposure in cases and controls is measured differently, or when cases and controls may differ in their UkeUhood of recalling exposures (Roberts and Lee-Joe 1993). As this study did not rely on parental reporting of unintentional injuries recall bias should not arise. The measurement of exposure was identical for cases and controls, and as both cases and controls had been registered with a Nottingham GP since at least 3 months of age (a proxy for length of time resident in the district), cases and controls should have been equally as likely to present to the Nottingham A&E department, as to another A&E department outside of the Nottingham Health Authority area (whose records were not searched). Therefore there should be little bias in the measurement of exposure in this study.

2.2.7 Identification of confounding variables

Numerous risk factors for childhood unintentional injury have been identified (Avery and Jackson 1993, Child Accident Prevention Tmst 1989, Rivara 1982, Baker 1975). Some of these may act as confounding variables, as they may be associated with A&E attendance for unintentional injuries and also with admission to hospital for unintentional injury.

Socioeconomic disadvantage has been found to be associated with A&E attendance for unintentional injury (Alwash and McCarthy 1988, Constantinides 1988, Walsh and Jarvis 1992, Walsh et al 1996) and with admission for unintentional injury (Bijur et al 1988a, Eminson et al 1986, Sellar et al 1991, Spencer at al 1993). Single motherhood, family size and matemal age at birth of first child have been found to be associated with hospital admissions (Bijur et al 1988c, Taylor et al 1983, Wadsworth et al 1983), and with medically attended unintentional injury (i.e. primary and secondary care attendances and hosphal admission combined), but the association between these factors and A&E attendances for unintentional injury have not so far been studied.

These factors are not routinely recorded in unintentional injury cases presenting to the A&E department in Nottingham. Therefore data on such factors was not avaUable for use in this study. However, socioeconomic disadvantage was assessed by using a local deprivation score based on postcode, comprising a combination of census and County CouncU data indices including lack of a car, families wdth children receiving free school meals, unemployment, lack of **skills,** poor housing such as lack of ˙mside WC, shared dwelUngs, non owner occupation, overcrowdmg, educational level, ethnicity, single parent famiUes, households with chUdren ˙m care, and criminal justice ˙mdices such as convictions for assault or for burglary (Nottinghamshire County CouncU 1985).

This deprivation index was chosen in preference to the Jarman score (Jarman 1983, Jarman 1984) because it is locally applicable and there is some evidence of a London bias in the Jarman score in that deprived areas in London are identified weU by the score, but areas of a sunUar degree of deprivation outside London are identified less well (Talbot 1991). Also the Jarman score was devised for estimating general practitioners workload, not for identifying areas of socioeconomic disadvantage. Consequently some of the indicators such as persons Uving alone, or proportion of households changing address in the preceding year are not direct measures of deprivation (Davey-Smith 1991, Morris and Carstairs 1991). The Townsend score (Townsend et al 1988), which is based on four census data based indicators; unemployment, overcrowding, lack of a car and housing tenure would be appropriate for use in this study, but as the study was designed to be used to influence local policy, the local deprivation score, with which local policy makers were familiar, was used. The deprivation score for each case and control was obtained from the postcode. Deprivation score was then adjusted for in the analysis as discussed below.

Proximity to hospital was considered to also be a confounding variable, as it may be associated with predisposition to attend the A&E department, (Lyons et al 1995, Garnett and Elton 1991) and UkeUhood of admission i.e. those living fiirther away may be less Ukely to attend, but they may also be more likely to be admitted because such cases would have more difficulty accessing the department should complications occur. Consequently if more cases than controls lived at greater distances from the hospital this might lead to underestimation of the odds ratio; whUst more controls Uving at greater distance from the hospital might lead to one estimation of the odds ratio. For this reason proximity was calculated based on postcode usmg a package which mapped postcodes to wards. Distance to hospital was calculated by using the distance from the centre of the ward to the hospital as the hypotenuse of a right angled triangle . Proximity to hospital has also been adjusted for in the analysis.

Intentional injury was also considered to be a possible corvfounding variable, as chUdren with a previous history of intentional injury or suspected intentional injury may be more Ukely to attend an A&E Department following an injury in order to confirm the diagnosis and may be more likely to be admitted until the diagnosis can be confirmed. For this reason the Child Protection Register was searched for all cases and controls. Any children who were currently on the register, or who had ever been on the register (which contained active and inactive cases) were excluded.

Similarly significant physical and or mental impairment were considered as possible confounders due to the possibility of the physical or mental impairment increasing or decreasing the risk of injury (Pless et al 1989a, Roberts and Norton 1995, WiUiams 1973), influencing parental predisposition to take the child to hospital and influencing the decision to admit by the medical officer. The Special Needs Register of the Community Unit of Nottingham Health Authority was therefore searched for all cases and controls and such children were excluded.

2.2.8 Data entry

The data were entered onto an EPI-INFO data base (Centers for Disease Control and World Health Organisation 1990) and verified by repeat entry.

2.2.9 Data analysis

Univariate analyses were undertaken using the EPI-INFO package. Comparisons of the frequency of confounding variables between cases and controls were undertaken using χ^2 tests. Unadjusted odds ratios were calculated using McNemar's test by the method described by Breslow & Day (Breslow and Day 1980). EGRET software (Statistics and Epidemiology Research Corporation and Cytel Software Corporation 1991) was used to undertake conditional logistic regression analysis to calculate odds ratios adjusted for confounding variables and also to calculate 95% confidence intervals around the odds ratios.

The ISS of injuries resulting in admission were compared with those resulting in A&E department attendance. Comparisons were made between severity scores of admission and attendance injuries in the same child (cases only) using Wilcoxon matched pairs signed rank test and between attendance injuries in the cases and controls using the Mann Whitney U test.

2.3 Results

2.3.1 Selection and exclusions of cases and controls

A total of 444 admissions occurred in 1990 to children aged under 5 following unintentional injury. Of these 7 were second admissions in the same year for unintentional injury, therefore 437 children were admitted for unintentional injury in the year. Of these, 21 children had had a previous admission for unintentional injury prior to 1990 and were excluded. Fiffy nine chUdren were excluded because they had not been registered with a general practitioner on the Nottingham FHSA list since the age of at least 3 months. One child was excluded because the diagnosis was suspected non-accidental injury and a fiirther 8 children excluded because they were, or had been on the Child Protection Register. Six children were excluded because they were on the Special Needs Register. This left a total of 342 cases which were matched with one control on sex and date of birth. Eight of the controls selected from the Family Heahh Services Authority list had been selected as cases for the study and therefore a fiirther 8 controls were selected, taking the next child on the Ust of the same sex and date of birth, or if this was not possible, the next child on the list of the same sex, with the date of birth closest to that of the case. Eleven of the control children initially selected had been admitted to hospital for an unintentional injury prior to 1990 and these were excluded and replaced by a further 11 controls. Six conttol children were excluded because they were, or had been on the Child Protection Register, these were replaced by a fiirther six conttols. None of the control children were found on the Special Needs Register.

2.3.2 Characteristics of cases and controls

The age and sex distribution of cases and controls is shown in Table 2.1 Data is provided for cases only as controls were matched on sex and date of birth, therefore the control data is identical.

Table 2.1. Age and sex distribution of cases at date of cases first admission (percentage).

Age (years)	Male	Female	Total(%)
Under 1	33	35	68(19.9)
1	58	46	104(30.4)
2	45	33	78(22.8)
3	23	28	51(14.9)
4	26	15	41(12.0)
Total	185(54.1)	157(45.9)	342

The distribution of cases and controls residing in deprived areas is shown in Table 2.2. It can be seen that significantly more cases than controls resided in a deprived area.

Table 2.2. Distribution of cases and controls residing in deprived areas (percentage).

Deprivation score	Cases	Controls	Total
Below average deprivation	162 (47.2)	201 (58.6)	363
Moderate deprivation	54(15.7)	33 (9.6)	87
Severe deprivation	50(14.6)	31 (9.0)	81
Extreme deprivation	61 (17.8)	59(17.2)	120
¶ Total	327	324	651

$\chi^2 = 13.7$ with 3 degrees of freedom, $p = 0.003$. ¶Deprivation score could not be calculated for 15 cases and 18 controls, as either the postcode was not found or the address was not included in the Nottingham County Council's Deprivation Area Study (Nottinghamshire County Council 1985).

The distance from place of residence to hospital for cases and controls is shown in Table 2.3.

Table 2.3. Distance from place of residence to hospital of cases and controls (percentage).

Distance	Cases	Controls	Total
Less than 1 mile	6(1.8)	5(1.5)	11
1 -2 miles	52(15.2)	61 (17.8)	113
>2 ≤ 5 miles	167(48.8)	152(44.4)	319
>5 ≤ 10 miles	74(21.6)	86(25.1)	160
> 10 miles	5(1.5)	13 (3.8)	18
Total	304	317	321

Postcode unavailable or not included in mapping package for 38 cases and 25 controls.
χ^2 = 5.7 with 4 degrees of freedom, p=0.22.

2.3.3 Injuries occurring to cases and controls

The injuries resulting in the index admission for the cases and the injuries resulting in A&E Department attendance for cases and controls are demonstrated in Table 2.4. Admissions for injury have been compared with first attendances for injury amongst conttol chUdren to compare the types of injury resulting in admission and attendance and to eUminate the effect of multiple attendances on independence of observations, which would occur if the comparison was made between admissions and attendances in cases. First attendance injuries in cases and controls have then been compared to demonstrate that type of first attendance injury did not differ between cases and controls. The distribution of injury types between cases and controls was not found to be significantly different. However, head injuries and fractures comprised a greater proportion of the admissions than of the attendances, whilst lacerations and soft tissue injuries comprised a greater proportion of the attendance injuries than of the admission injuries.

Table 2.4. Frequency of type of injury resulting in admission to hospital for cases and in first attendance at hospital for cases and controls (percentage).

Injury Type	Admissions (%)	First attendances for cases (%)	First attendances for controls(%)
Head injury	120(35.1)	26 (22.8)	13(18.5)
Fractures	65 (19.0)	6 (5.3)	7(10.0)
Lacerations	27 (7.9)	31 (27.2)	23 (32.9)
Burns & scalds	55(16.1)	12(10.5)	6 (8.6)
Ingestions¶	58(17.0)	9 (7.9)	7(10.0)
Soft tissue injuries	10 (2.9)	23 (20.2)	13(18.6)
Foreign bodies¶	3 (0.9)	3 (2.6)	2 (2.9)
Bites¶	2 (0.6)	-	-
Inhalation¶	2 (0.6)	4(3.5)	-
Total	342	114	70

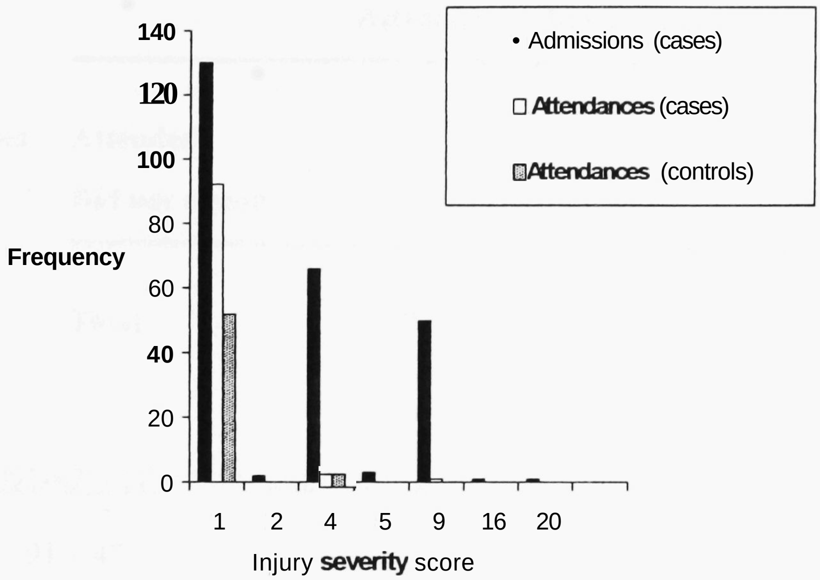
Comparing admission injuries to first attendances for controls χ^2 = 65.7, 5 df, $p<0.001$.
Comparing attendance injuries in cases and controls χ^2 =2.47, 5df, p=0.78.
¶Ingestions, foreign bodies, inhalations and bites combined for comparisons.

2.3.4 Comparisons of injury severity between injuries resulting in admission and those resulting in attendance at the accident and emergency department

Twenty one (6%) manual in-patient records relating to the cases admission injury were unobtainable, despite three attempts to trace the notes over a one month period. Sixty three children (18%) were admitted with poisoning or suspected poisoning (58), inhalation (2) or a foreign body in an orifice (3) which cannot be coded under the AIS. The in-patient notes of five children (1.5%) did not contain any reference to an admission for an injury, despite both the manual A&E records and the computerised Patient Administration System records recording the injury and recording that the chUd was admitted to hospital. In total therefore, twenty six chUdren's injuries could not be scored for injury severity due to either inability to trace the notes, or due to no entry being found in the in-patient records.

The manual A&E records could not be traced for 10 (6.7%) of the total 149 attendance injuries in cases, and in 5 (6.8%) of the total 74 attendance injuries in controls. The distribution of injury severity scores of the admission injuries in cases and for the first attendance injuries in cases and controls are shown below in Figure 2.1. The injury severity scores for admission and attendance injuries were both negatively skewed. The WUcoxon matched pairs test was therefore used to compare injury severity scores between admission and attendance injuries in the cases. The ISS among cases was significantly higher for admission injuries than attendance injuries ($Z=-4.3$, 2 taUed $p<0.001$). The Mann Whitney U test was used to compare the ISS for attendance injuries of cases and controls, and no significant difference was found ($Z=-0.03$, 2 tailed $p=0.98$).

Figure 2.1. Injury severity scores for admission and attendance injuries.



2.3.5 Unadjusted matched analysis for case-control pairs.

A total of 114 cases had had at least one attendance at the A&E department prior to their first admission to hospital for unintentional injury (33.1%). Seventy controls (20.5%) had at least one A&E attendance prior to the date of the matched cases index admission. The analysis based on the matched case-control pairs is shown in Table 2.5.

Table 2.5. Matched analysis for case-control pairs.

		Controls		
		Attended	**Did not attend**	**Total**
Cases	**Attended**	**23**	**91**	114
	Did not attend	**47**	181	228
	Total	70	272	342

$$\chi^2 = \frac{(|91-47| - 1)^2}{91+47} = 13.4$$, with 1 degree of freedom, $p<0.001$

Odds ratio $= \frac{91}{47} = 1.94$ (95% confidence interval, 1.26, 2.70)

2.3.6 Adjusting for the effects of confounding variables

The odds ratios for all injuries and for specific injuries adjusted for the confounding variables of deprivation and proximity to hospital using conditional logistic regression are shown in Table 2.6.

Table 2.6. Odds ratios for all attendance injuries and for specific attendance injuries after adjustment for deprivation and proximity to hospital.

Attendance injury¶	Adjusted odds ratio	95% CI
All injuries	1.98	1.32,2.96
Soft tissue injury	2.30	1.04,5.17
Lacerations	2.02	1.01,4.04
Head Injuries	2.23	0.97,5.17
Burns& scalds	1.92	0.59, 6.22
Other injuries†	1.84	0.82,4.10

¶fricludes only first attendance injuries to avoid multiple counting of children with more than one attendance injury. †Other includes fractures, ingestions, inhalations, foreign bodies and bites.

Cases were also found to have been significantly more likely to have had multiple prior attendances than the controls, with the adjusted odds ratio for more than one prior attendance being 1.71 (95% confidence intervals 1.28, 2.26).

2.4 Discussion

This study has demonstrated that children aged under 5 years who have been admitted to hospital foUowing an unintentional injury are more likjely to have previously attended the A&E department following an unintentional injury than children who have no history of hospital admission for injury.

2.4.1 Methodological limitations

There are several methodological issues which must be considered before discussing the results further. Numerous factors may influence the decision to admit a child to hospital following an unintentional injury. Adjusting for proximity to hospital and for socioeconomic disadvantage in the analysis has been undertaken to control for these factors. Excluding children on the child protection register and those on the special needs register should minimise the influence of previous actual, or suspected, unintentional injury and of physical or learning disability on the decision to admit.

Although this study has been unable to adjust for all possible factors which may influence admission to hospital, the significantly higher ISS of admissions among the cases compared to attendances among the controls, coupled with no significant difference in the severity of attendance injuries in cases and controls, confirms that those admitted did suffer more severe injury, making it less likely that factors other than injury severity were important in the decision to admit an injured child to hospital. It therefore seems unlikely that confounding factors can explain the relationship demonstrated between hospital admission for injury and attendance at the A&E department for injury.

2.4.2 Using A&E department attendance as a predictor for hospital admission

Previous studies have suggested that children experiencing medically attended unintentional injuries (hospital admissions, A&E department attendances and primary care attendances) are at greater risk of medically attended unintentional injury in the future (Bijur et al 1988a, Manheimer et al) and that those admitted to hospital are at greater risk of future admission (Bijur et al 1988a, Eminson et al, SeUar et al). Several authors have suggested that these children constitute a high risk group who should be targeted with injury prevention programmes (Bijur et al 1988a, Eminson et al, Sellar et al, Ohn et al). The study presented in this thesis is the first study to demonstrate a relationship between minor injuries in children under 5 years resuhing m A&E attendance and future, more severe, injuries resulting in hospital admission.

The argument concerning targetting injury prevention could be extended to children attending the A&E department based on the results of this study. However, only one third of children who were admitted to hospital following an injury had had a prior attendance at the A&E department. Two thirds of children admitted to hospital following an injury have therefore had no prior attendance. Using attendance as a factor for predictmg fiiture injury would therefore miss two thirds of aU chUdren who are gomg to be admitted to hospital with a fijture injury, because they would not have been identified as being in the high risk group.

It is not possible to calculate the predictive value using a case control design, as the controls do not represent the entire population of children aged under 5 years in Nottingham, unlike the cases. The predictive value is important as it represents the proportion of chUdren who attend A&E who go on to be admitted to hospital. The predictive value depends not **only** on the sensitivity and specificity of the screening test, but also on the prevalence of disease. With rare diseases, most positive test results will be false positives and the predictive value **will** be low (Sackett et al 1991). As only 1-2% of the childhood population are admitted to hospital foUowing an unintentional injury each year (Department of Trade and Industry 1996), the predictive value of attendance in predicting hospital admission wiU be low. This **limits** the utility of the test as many children will be identified as being at risk of admission who never go on to be admitted. Bijur and colleagues found similar results from their analysis of the 1970 British Birth Cohort; 3 or more mjuries in the first 5 years of life had a sensitivity of 12.6%, a specificity of 96.9% and a positive predictive value of 14.2% for predicting which children would have 3 or more injuries in between the ages of 5 and 10 years (Bijur et al 1988a). The utility of using factors to target children for injury prevention programmes is discussed in detail in the second study presented in this thesis.

2.4.3 Notification of injury information from secondary to primary care

The transfer of information concerning chUdren attendmg A&E departments to the primary health care team, is the first step in the process of providing injury prevention for chUdren who have **already** suffered an unintentional injury. Laidman (Laidman 1987), amongst other workers (Levene 1992, Carter et al 1992, Morgan and Carter 1996b, Kay 1989, Reynolds 1996) have suggested that notification of chUdhood injury attendances at the A&E department is the role of the paediatric Uaison health visitor. More than 400 such posts were found to be in existence in hospitals across the UK in 1994 (Morgan and Carter 1996b). Four studies discuss the issue of the nature of the information to be transmitted bewteen secondary and primary care (Laidman 1987, Morgan and Carter 1996b, Kay 1989, Reynolds 1996) and one suggests a minimum data set for such notifications (Laidman 1987). Each suggests that the mfonnation needs to include injury type and causation, and each suggests that information on injury causation is usuaUy lacking.

Each of these studies discusses post injury follow up visits as an appropriate response to receiving notification of a child's injuries. Carter and colleagues however, found **only** 13% of heahh visitors in their survey always undertook a post injury foUow up visit on receipt of a notification (Carter et al 1992). Factors which influenced the Ukelihood of a visit were reported as the nature of the injury, the health visitors knowledge of the famUy and the occurrence of repeated injuries (Carter et al 1992). Reynolds' small qualitative study also attempted to identify the factors influencing the decsion to carry out a post injury follow up visit. She interviewed six health visitors in one heahh district and found that prior knowledge of the family, perceived **difficulty** in making contact with a client, child's age and development in relation to injury type, timing of the notification, pressure of work and "gut feeling" aU played a part in the decision on whether or not to carry out a visit (Reynolds 1992).

Coombes undertook a survey of parents to assess their perceptions of post injury follow up visits and found that most parents perceive them to be a negative or difficult experience. Some perceived that they were being suspected of child abuse and that they were not being beUeved. They reported that they were surprised when the health visitor contacted them, because they had not been made aware of the referral and they felt the visits focussed on the needs of the child at the expense of the feeUngs and needs of the parent. She suggested that if the parents already knew the health visitor then the visit may be less threatening for them. The parents expressed a desire for post injury follow up visits in which the health visitor had a positive and supportive attitude and one in which the needs of the whole family were considered (Coombes 1991).

Health visitors have also been reported as finding post injury follow up visits difficuh for a number of reasons (Laidman 1987, Reynolds 1996). They perceived the parents to be suspicious of the visit, suspecting child abuse and felt the vists may be guilt provoking for the parents. Some health visitors perceived them as being sufficiently difficult that they may interfere with a good relationship they already had estabUshed with a cUent. Heahh visitors also felt that in some circumstances they, and the families, were not in a position to make the home environment safer, hence post injury follow up visits could be seen as increasing feelings of impotence and decreasing self esteem amongst families already living in very difficuh circumstances.

One study, so far, addresses the effectiveness of health visitor post injury follow up visits (Kay 1989). Kay reports resuhs from a study in Southampton in which three randomly chosen groups of health visitors (numbers not specified) were provided with data daily on A&E attendances for injury among children on their caseload. The health visitors were asked to undertake a home visit to discuss how future injuries might be prevented within 2 weeks of receiving the information. Information on the proportion of injury notifications which received a home visit are not given. She reports that the repeat injury rate in children who had attended the A&E department at least twice in the preceding 6 months was reduced by 40%. No figures are given in the report to support this statement and no information is given regarding the use of a control group. There is insufficient detail regarding study methodology in this report to enable a judgement to be made on the effectivness of post unintentional injury follow up visits. Further work in this area is needed.

In the absence of evidence suggesting post injury follow up visits are effective, and in light of the difficulties experienced both by parents and heahh visitors undertaking such visits, in addition to the large proportion of children admitted to hospital who would have been missed by such a system of targetted practice, fijrther expansion or encouragement of a post injury follow up service by heahh visitors, should not, at present, be reconmiended.

2.4.4 Using notification data as part of an injury surveillance system

If information on A&E department attendance is not to be used for identifying famiUes requiuing post injury follow up visits, is there an alternative use to which primary health care teams could put such data? Several workers have suggested that primary health care teams should be involved in injury surveillance systems (Department of Health 1993a, Greig 1987, Kendrick 1994b, Agass et al 1990, Child Accident Prevention Tmst 1993b). Graiter has defined injury surveillance as:

"the ongoing systematic coUection, analysis and mterpretation of health data needed to plan, implement and evaluate public health programs" (Graiter 1987)

He suggests that such a system can be used for providing quantitative estimates of injury mortality and morbidity, for detecting clusters of injury events, for identifying factors in injury occurrence, for stimulating epidemiologic research and for determining the effectiveness of injury control measures.

At present the system of notification of injured children attending A&E departments represents systematic data collection on injury type (however, in some cases this is not systematic data collection as some A&E departments notify only selected cases), but there is little evidence that data on injury causation or location of injury is routinely coUected (Laidman 1987, Morgan and Carter

1996b). At the primary health care team level, such information could be used to increase awareness of team members of the nature and extent of the problem of chUdhood unintentional injuries, which may be a necessary prerequisite to the team undertaking injury prevention work. Many of the health visitors in Carter and coUeagues' shady (Carter et al 1992) and Laidman's study (Laidman 1987) did not collate their notification data and consequently did not have an accurate perception of the epidemiology of injuries to children on their caseload . The increasing emphasis on health needs assessment may mfluence the use of such data in the fiiture, although little evidence exists that primary health care teams have embraced this process to date (Audit Commission 1996).

Whilst A&E data can be used alongside primary health care team data on childhood unintentional injuries to describe the mortality and morbidity attributable to unintentional injuries, at a primary health care team level it may be more difficuh to use such data for detecting clusters of injuries. These difficuUies arise from two sources. Firstly the number of injuries occuring to chUdren at the practcie level will be smaU, secondly in urban and suburban areas general practice populations are subject to considerable overlap and hence do not represent entire communities, so individual teams will not necessarily have a representative picture of injury occurrence in their locaUty, unless data is aggregated between practices in an area.

Using data at the primary health care team level may be possible for identifying factors in injury occurrence, but again in urban and suburban areas this is probably only possible tf aggregated data is produced, for the same reasons that identifying clusters of disease may be difficuh at the mdividual practice level. If local data can be used to identify clusters of injuries or factors in injury occurrence, then injury prevention programs could be directed at those specific injuries.

Demonstrating the effectiveness of injury prevention at a primary care team level using injury mortality and morbidity wiU be extremely difficuh due to the small numbers of injuries occurring. Again aggregating data from a number of practices may provide the solution to this. An altemative is to use process or intermediate outcome measures such as use of safety equipment or reductions in hazards in the home.

2.5 Conclusion

Minor injuries have been demonstrated to predict more major mjuries in pre school children. The proportion of chUdren who suffer more major injuries who have had a prior minor injury is relatively smaU. It has been suggested that injury prevention should be targeted to children who have suffered injury, to prevent future injury, but the results from this study suggest that the utility of such an approach will be limited in terms of it's impact on childhood injury morbidity. This finding has impUcations for the coUection and notification of unintentional injury data in A&E departments and it's transfer to primary care, and also for post injury follow up visits by health visitors.

The pubUshed Uterature suggests that the current system of notification following A&E department attendance would not seem to be achieving it's potential utiUty in terms of mjury prevention m childhood. Systems operate in many hospitals, yet a standardised data set including data on injury causation and location is not in routine use. A post injury follow up visit is considered appropriate on receipt of a notification by most authors in the field, yet the majority of health visitors do not undertake such visits. Post injury follow up visits are perceived by parents and health vishors as being difficult and there is, as yet, a lack of evidence to suggest they are effective in reducing repeat injuries.

Even if such visits could be demonstrated to be effective, the number of repeat injuries is small and the heahh visitor input required to achieve a small reduction in total injury morbidity would be large and may not be cost-effective. The second study presented in this thesis continues the exploration of the utUity of using a range of factors to identify children at risk of injury to whom injury prevention programs can be targeted and the impact of such injury prevention programmes on injury morbidity in the community.

The Uterature suggests that few health visitors collate the information provided by notifications, hence they are not routinely used to constmct a picture of the local injury epidemiology, and in most cases the information provided is insufficient to identify factors influencing injury occurrence, hence severely restricting the utility of such data at a local level.

The implications from the findings of this study and from the review of the published literature, are that the role of the paediatric liaison health visitor in chUdhood injury prevention, the transfer of information between secondary and primary care, the use of notification data for other purposes in primary care and the health visiting response to notification require fiirther consideration.

Chapter 3

Preventing children's injuries in primary care: a high risk group or a whole population approach?

3. Preventing children's injuries in primary care - a high risk group or a population approach?

3.1 Objectives

The objectives of this study are to:

examine the associations between risk factors for childhood unintentional injury and a variety of injury outcomes including primary health care team attendance, accident and emergency department attendance, hospitalisation for injury and an injury severity score;

to calculate the sensitivity, specificity and positive predictive value of each risk factor in identifying children who will subsequently suffer an injury and to calculate the number needed to treat to prevent one injury using a targeted and a population approach to injury prevention.

3.2 Method

3.2.1 Study design

A cross sectional survey was undertaken to measure the prevalence of risk factors for childhood unintentional injury. This was followed by a cohort study to determine the frequency and severity of injury in children with and without each of the risk factors for injury, over a one year period.

3.2.2 Study setting and study population

The study was undertaken in one suburban general practice in Nottingham. The practice was a three partner practice with a list size of 4,600 of which 17% were children aged 16 years and under. The practice provides a minor injury service offering the range of treatments previously described in primary care (Carter and Jonesl993a) and advertised in the practice leaflet. The practice is situated 4 miles from the only accident and emergency department in Nottingham. The majority (86%) of the practice population have access to a car (Nottinghamshire FamUy Health Services Authority 1993), but the accident and emergency department can be reached by one bus journey.

The practice population is relatively socioeconomically advantaged with a low unemployment rate, a high rate of car ownership, a low percentage of unskilled persons, of persons residing in overcrowded conditions and a low percentage of single parent households (Nottinghamshire Family Health Services Authority 1993). The practice population is also relatively stable with an estimated 12% of patients having changed address in the previous year (Nottinghamshire FamUy Health Services Authority 1993). The proportion of the practice population classified as living in a household headed by a person bora in the New Commonwealth is also low, when compared to the figure for the population of

Nottingham (Nottinghamshire Family Heahh Services Authority 1993, Office of Population Censuses and Surveys 1993).

3.2.3 Sampling frame, sampling technique and sample size

The computerised age and sex register of the practice was used as the sampling frame. Although inaccuracies are well documented in general practice registers (Walsh 1994, BowUng and Jacobson 1989, Bickler and Sutton 1993, Silman 1984) due to births, deaths, migrations into and out of the practice area, there is no other register avaUable for identifying children resident in an area. Previous work suggests that practice registers are most likely to be inaccurate in areas with a highly mobile population, such as irmer city areas and also that they are more lUcely to be maccurate for the young and those from lower social classes (Bowling and Jacobson 1989). Many of these factors do not apply to the practice population used in this study; the practice is situated in a suburban area, and the survey was targeted at parents with children who are less likely to be mobile that than single people without dependants. The low proportion of the practice population employed in unskilled work suggests the majority of the practice population do not belong to social classes IV or V. The practice age-sex register therefore seemed to be the most appropriate sampling frame for the study.

The sample used for the study comprised all children aged 16 years and under registered with the practice on 1st October 1993 (n=771). This sample size was calculated to have 80% power at the 5% significance level to detect relative risks of injury in the next year of 1.6 for previous injury, 1.8 for lack of access to car, 2.2 for unemployment, 2.4 for belonging to an ethnic minority group, 2.5 for mother aged 20 or under at birth of first child, and 3.3 for single parenthood. This calculation was based on an estimated 16% of children in the unexposed group having a medicaUy attended injury in the next year and on the prevalence of lack of access to a car, unemployment, ethnicity and single parenthood taken from the practice profile based on 1991 census data (Nottinghamshire Family Heahh Services Authority 1993). The prevalence of previous injury has been estimated based on a 1 in 10 sample of the notes of chUdren registered with the practice, and was estunated to be 40%. The prevalence of matemal age 20 or under at birth of first child (4.5%) has been estimated by searching the medical records of aU primigravida receiving ante-natal care at the practice.

3.2.4 Questionnaire development

A postal questiormaire was chosen for this survey because of ease of administration and cost (Streiner and Norman 1995), and because the characteristics of the practice population, estimated from the census, with a low unemployment rate (7.3%) and a low percentage of persons employed in unskilled occupations (0.9%) suggests that literacy may not be a major problem in this population. The low percentage of the practice population who reside in a household headed by a person bom in the New Commonwealth (4.4%) suggests the proportion of patients for whom English is not their first language will not be high. This coupled with clinical experience of providing primary care to this population over several years, with only the very rare need for interpreters, would suggest translation of the questionnaire into other languages would not be needed.

The questionnaire consisted of three sections (shown in Appendix C); the first on safety practices and safety equipment possession and use, the second on parents' perceptions of risk and the third on sociodemographic details and risk factors for accidental injury. The first two sectrions have not been used for this study and will not be discussed further (Woods et al 1994).

The third section of the questionnaire concemed the families' sociodemographic and economic detaUs, mcludmg those associated with childhood accidental injury. These included the age of the child, sex, number of chUdren in family, ethnicity, single parenthood, unemployment status of respondent and partner, housing tenure, overcrowding, non ownership of a car, receipt of government benefits other than child benefit, maternal age at birth of first child, number of previous medicaUy attended unintentional injuries and postcode. Unemployment, housing tenure, overcrowding and non-ownership of a car were included as individual variables, as well as being components of the Townsend score, which is based at ward level and obtained from the postcode (Townsend et al 1988). This would aUow the relationship between each variable and mjury frequency to be determined at an individual level as well as at the level of electoral ward, so minimising the effect of the ecological fallacy. Data on means tested benefits have been included as an indicator of assess household income.

No attempt has been made to assess family stress, as although this has been demonstrated to be associated with ingestions(Beautrais et al, Sibert 1975, Eriksson et al, Bithoney et al), the authors have used different tools to measure stress, including tools designed by the authors without any data on vaUdity or reUabiUty. AU these studies used an mterview with the parents rather than a postal questionnaire. Also, these studies assessed stress retrospectively at the time of an injury. The data from this questionnaire will be used prospectively over a one year period as wiU be described below. Assessing stress prospectively is unlikely to provide an accurate measurement of family stress at the time of an injury if the foUow up period is one year. It was therefore decided that family stress should not be mcluded m the questiormaire. Similarly no attempt has been made to measure chUd behaviour, as again authors have used different tools to measure this (Bijur et al 1988c, Pless et al 1989a, Matheney et al 1971, Padilla et al 1976) e.g. Rutter Child Behaviour Questionnaire, the Bristol Social Adjustment Guide, matemal observations of temper frequency and attention span and observations by trained observers during physical education classes. Each study used interviews rather than a postal questiormaire.

Questions concemmg hearing and visual impairment were also not included in the questionnaire, as at the time of it's development the only studies assessing the relationship between sensory impairment and injury frequency had used physical measurements to determine the degree of impairment, and this would not be possible within a postal questionnaire survey (Pless et al 1989a, Petridou et al 1995). Smce conducting the survey, one study where parents were asked if their child had normal hearing and normal vision during an interview to assess the relationship between sensory impairment and pedestrian injury has been published (Roberts and Norton 1995). However, it does not report any validation of the self reported hearing or visual unpairment and no information is given on the classification of children with corrected visual impairment. Visual impairment, unless the vision is very poor is unlikely to be recorded in the primary care records, or on the District register of chUdren with special needs. Hearing loss may be recorded in the medical records, but the recording is Ukely to be very incomplete as health visitors and school nurses screen for hearing impairment and refer to a Hearing Assessment Centre without referral to the general practitioner first. Those children requiring surgical intervention, are likely to have this recorded m their primary care records but those not requiring surgical intervention may be less likely to have this recorded. As a result of the difficulty of validating self reported sensory impairment, these questions were not included in the questionnaire.

3.2.5 Validity and reliability

Maximisation of content validity of the questionnaire has been attempted by includmg questions on the risk factors for unintentional injury as described above and by obtaining "expert" advice from the Child Accident Prevention Tmst and from members of the multi-agency Nottingham Accident Prevention Group.

It has been possible to assess criterion validity for only some of the items on the questionnaire, namely age of chUd, sex, postcode and history of previous medically attended unintentional injury. This has been achieved by searching a one in 10 sample of the notes of children still registered with the practice one year after the original questionnaire survey was conducted. Concordance between the response given on the questionnaire and the data from the primary care records has been assessed by calculating kappa coefficients (Streiner and Norman 1995).

Constmct validity of the risk factor questions on the questionnaire is difficuh to demonstrate, although some factors have previously been found to be associated with other measures of risk of injury. Socioeconomic disadvantage has been demonstrated to be associated with lower rates of safety equipment possession (Kendrick 1994a) and greater home hazards (Glik et al 1993a, Glik et al 1993b, Kendrick 1994a). Single parent families, low income families and non owner occupiers have been found to possess fewer items of safety equipment (Glik 1993b, Kendrick 1994a). The testing of constmct validity of these risk factor questions has been undertaken by comparing self-reported safety practices (as a measure of risk of injury) by risk factors in a fiirther study by the author (Kendrick and Marsh 1997). Families with six or more risk factors were found to be significantly less Ukely to use a smoke alarm or stairgate, were more likely to use a pillow and a duvet in the cot of a child aged under one year, were more likely to use a babywalker and to have a dummy or toy on a cord or string around the neck of their chUd. The association between risk factors and these safety practices suggests the risk factor questions used in this study do have constmct validity. Further work by the author, examining risk factors and observed hazards in the home is currently being undertaken to eliminate the effect of potential differential over reporting of safety practices by risk factor group.

The reliability of the questions has been assessed by using a sample of parents not registered at the practice for a test-retest procedure. All parents attending a child health clinic held at a general practice surgery in a suburban area with a similar socioeconomic profile to the area in which the survey was conducted, were asked to complete a questiormaire whilst waiting to be seen. They were then sent a fijrther questionnaire one week after completing the first questionnaire, with a freepost envelope. Kappa coefficients were calculated to assess the reliability of the responses to the two questiormaires.

3.2.6 Piloting of the questionnaire

The questionnaire was pUoted on 20 consecutive parents attending the practice used for the reliability testing during a one week period. Following the pUot, several questions were reworded to reduce ambiguity, for example the phrase "including step children and adopted children" was added to the question on number of children in the family. Some questions were perceived as intmsive by some of the responders to the pilot questionnaire, for example the questions on ethnicity and on the household composition and relationship to respondent. These questions were therefore prefixed with the statement "you do not need to answer these questions if you do not wish to do so".

3.2.7 Conduct of the survey

The questiormaire was maUed with a covering letter and a prepaid envelope to all parents of chUdren registered with the practice on 14 October 1993. The covering letter used the practices' letterhead and was signed by one of the general practitioners from the practice as this has been demonstrated in previous research to increase the response rate (Streiner and Norman 1995). The telephone number of each family was obtained from the practice database. Families who had not responded three weeks after the first mailing were contacted by phone, reminded and offered another questiormaire. A maximum of 2 attempts were made to contact each family. Families for whom the practice did not have a telephone number and who were not listed in the telephone directory or registered with directory enquiries were sent a second questionnaire. In total, 127 second questionnaires were sent to families contacted by phone who requested a second questiormaire, or those unable to be contacted by phone. All second questionnaires returned within a further 3 week period were included in the study.

3.2.8 Data coding and data entry

The questionnaire was pre-coded. All data were entered onto the SPSS-PC database (SPSS Inc 1990) twice by mdependent people and verified by identifying discrepancies between frequencies of each variable. Any discrepancies were checked with the original data and corrected.

3.2.9 Assigning risk factors

Overcrowding was calculated by dividing the number of people Uving in the house by the number of rooms in the house. Overcrowding was then defined as more than one person per room (Office of Population Censuses and Surveys 1993). The level of deprivation was assessed using the Townsend index of deprivation (Townsend et al 1988). This index is based on 4 indicators of material deprivation, unemployment, non owner occupation of house, lack of a car and overcrowding. This was obtained by mapping postcodes to electoral ward using the PC-CAM package and assigning the ward Townsend score to each postcode within that ward. Addresses without a postcode, addresses with new postcodes assigned after the software package was produced and addresses outside Nottingham could not be assigned to wards.

3.2.10 Cohort study

Data from the questionnaire survey were used as a measure of exposure to each of the risk factors described above. One year after the initial questionnaire was sent out, data on injury outcomes were obtained by a manual and computer search of the general practice and hosphal records.

The primary care medical notes were searched for each child still registered with the practice (and for non responders to the questiormaire who were still registered) and the occurrence of any medically attended injuries was noted. The details recorded on each injury included type of injury, treatment given and referral to secondary care.

Data on A&E department attendances and hospital admissions was also obtained from the primary care notes in those cases where an A & E discharge letter or a hospital discharge letter was present. Collection of data on A & E attendances from primary care medical records is likely to be incomplete, as the discharge letter is handed to parents in the department and they are told to take the letter to the general practitioner. As a result of this, the A & E module of the Patient Administration System was also searched for each child (responders and non responders) by name, address, date of birth, NHS number and general practitioner. Data on each attendance included injury type, treatment given and whether admitted to hospital. Children attending the primary health care team and being referred to A & E following an injury were classified as A & E attendances. PHCT attendances therefore consisted of children who received only primary care for their injury. This therefore allowed the relationship between the various risk factors for injury and injury outcomes in terms of hospital admissions, A & E attendances and primary health care team attendances for accidental injuries to be assessed.

All injury attendances and admissions identified from the primary and secondary care records, were scored for injury severity using the Abbreviated Injury Scale (Association for the advancement of automative medicine). As none of the children's injuries involved more than one body region, the injury severity score

(Yates 1990) was not calculated from the AIS.

3.2.11 Data analysis and statistical tests

The data were analysed using the Statistical Package for Social Sciences (SPSS Inc 1990). Univariate analyses were undertaken to assess the relationships between various risk and sociodemographic factors using χ^2 tests. The relative risk of injury and 95% confidence intervals for each risk factor by each injury outcome measure have been calculated, using the Confidence Interval Analysis package (Gardner, Wmter and Gardner 1989). As the number of injuries per child by each risk factor was skewed to the left, comparisons were made by transforming the data using $\sqrt{(x+1)}$ for the number of injuries (Snedecor 1956). The mean number of injuries has been compared between risk factor groups using unpaired t-tests. Multi-variate analyses were undertaken using logistic regression with the binary outcomes of any attendance at any health care facility for unintentional injury or not, primary health care team attendance or not, accident and emergency department attendance or not and hospital admission or not. Muhiple Unear regression was used to predict the numbre of injuries by each risk factor adjusting for the effect of other risk factors. The sensitivity, specificity and positive predictive value for each risk factor in predicting injury outcome and the number needed to treat (Sackett et al 1991) has been calculated for each risk factor.

3.3 Results

3.3.1 Response rate

A total of 771 questionnaires were mailed to parents of children registered with the practice. Eighteen questionnaires were retumed as not known at that address. A total of 587 questionnaires were received after the six weeks data collection period and one reminder. This was a response rate of 78%. The majority of the questionnaires were completed by the child's mother, 86% (507), 12% were completed by the child's father (73) and a fiirther seven questionnaires were completed by a sister (2), one adoptive mother (2), grandparent (one), godparent (one) and uncle (one).

3.3.2 Reliability testing

Thirty four questionaires were given to mothers at a chUd health clinic in a location with a similar socioecononuc profile to that of the study population. All were retumed completed. A second identical questionnaire was sent to each mother one week later. Twenty one were retumed (62%).

Eighteen pairs of questionnaires had identical responses for all questions. Three pahs of questionnaires contained a total of 4 responses which differed between the first and second questionnaires. The questions with complete concordance included age of child, sex of child, number of children in family, ethnic group, housing tenure, employment status of respondent, employment status of respondents partner, number of people residing at that address, postcode, access to car and receipt of means tested benefits. The kappa coefficient for each of these questions was therefore one.

One parent reported no unintentional medically attended injuries on the first questionnaire, but reported one on the second questionnaire with a comment that the chUd had had the injury in the week between completing the first and second questiormaire. This response was therefore excluded, leaving the remaining 20 pairs of questionnaires with identical responses on unintentional injury. One parent reported her age at birth of first child as 26 on the first questionnaire and 27 on the second, the Kappa coefficient for this question was 0.94. Finally two parents reported one more room in their house on the second questionnaire than on the first. The Kappa coefficient for this question was therefore 0.87.

3.3.3 Validation

Criterion validity was assessed by comparing the responses to four questions on the questiormaire with data recorded in the primary care records of a one in ten sample of chUdren of responders stiU registered with the practice one year after the survey. A systematic sample using every tenth child was used. Where a child had left the practice the next child on the list was used. The age, sex of the child and the postcode recorded on the questionnaú"es were identical to that recorded in the notes for all 58 children, therefore the kappa coefficient for each of these items was one. For 22 of the children, the parents reported a medically attended injury on the questionnaire which was also recorded in the medical records. For 28 chUdren the parents recorded no medically attended injuries and none were found in the medical records. For 6 children the parents did not record a medically attended injury, but details of an injury were found in the records and for 2 children the parents reported an injury but none were recorded in the medical records. The kappa coefficient for the question concerning previous injury is therefore 0.81.

3.3.4 Characteristics of children of responders and non responders

The age and sex of children for whom questionnaires were completed and of the practice population is shown in Table 3.1. There was no significant difference in the distribution of age and sex of children of responders and of the practice population.

Table 3.1: Age and sex of chUdren for whom questionnaires were completed and of the practice population, with age and sex specific response rates.

Age	Sex	Responders	Practice DODulation	Response rate (%)
0-11 months	Male	21	24	87.5
	Female	15	20	75.0
1-4 years	Male	99	111	89.2
	Female	76	112	67.9
	Missing	1	-	-
5-7 years	Male	72	78	92.3
	Female	44	66	66.7
8-11 years	Male	66	83	79.5
	Female	68	87	78.2
12-16 years	Male	56	86	65.1
	Female	67	86	77.9
	Missing	2	-	-
Total	Male	314	382	82.2
	Female	270	371	72.8
	Missing	3	-	-

The age distribution of chUdren for whom questionnaires were completed did not differ significantly from that of the non responders (χ^2 = 6.1, 4 degrees of freedom, p=0.19), but sigrüficantly fewer parents of girls responded (χ^2 = 9.6, 1 degree of freedom, p=0.002).

A search was made of the medical records of the children of non responding parents still registered with the practice one year after the survey. The parents of 166 children did not respond to the survey and 117 of these children were still registered with the practice one year later. All these notes were searched for recorded medicaUy attended unintentional injuries prior to the date of the survey and for postcode.

Seventy children had an injury recorded in their medical records (59.8%). The proportion of children with a previous injury in the group of responders was compared to that in the non-responders after stratifying for age (less than 5 years and older than 5 years). In the under 5 year age group there was no significant difference in the proportion of chUdren of responders (27.8%) and non responders (29.0%) with an injury recorded in their notes (χ^2=0.02, 1 df p=0.88). However a significantly greater proportion of older children of non responders (71.8%) had an injury recorded in their notes compared to children of responders (53.7%)(χ^2=9.16 1 df p=0.002).

Of the 117 children stiU registered with the practice 109 had a postcode from which a Townsend score could be assigned. Twenty children (17.1%) resided in a ward with a Townsend score above zero (defined as greater than average deprivation) compared with 16.7% of the children of responders. (χ^2=0.18, 1df, p=0.67).

3.3.5. The prevalence of risk factors

The prevalence of each of the risk factors for unintentional injury, other than age and sex, are shown in Table 3.2 below. It illustrates that the population are relatively affluent.

Table 3.2 Prevalence of risk factors for unintentional injury (n=587).

Risk or sociodemographic factor	Frequency (%)	Missing (%)
≥4 children in family	69 (11.8)	5 (0.9)
Single parent family	57 (9.7)	23 (3.9)
Matemal age ≤ 20	35 (6.0)	77(13.1)t
Non owner occupation	67(11.4)	13(2.2)
No access to car	39 (6.6)	15(2.6)
Ethruc group non white	23 (3.9)	34(5.8)
Receipt of means tested benefits	87(14.8)	20(3.4)
Previous injury	254 (43.3)	14(2.4)
Overcrowding¶	34 (5.8)	1 (0.2)
Unemployment¶¶	21 (3.6)	13(2.2)
Townsend score above zero	98(16.7)	91 (15.5)
Number of risk factorstt		
0	88(15.0)	15.0
1	188(32.0)	32.0
2	135 (23.0)	23.0
3	36(6.1)	6.1
4	29 (4.9)	4.9
5	17(2.9)	2.9
6	8(1.4)	1.4
7	2(3.4)	3.4

¶**overcrowding defined** as more than one person per room excluding kitchens and bathrooms less than 2 metres wide.

¶¶ unemployment refers to families where both parents were unemployed.

t matemal age at birth of first child was appropriately missing in all 77 cases as the respondent to the questionnaire was not the child's mother.

ft respondents not answenng any risk factor questions were excluded from this analysis (n=84).

3.3.6 The relationship between risk factors for childhood unintentional injury

As expected there were no significant associations between the sex of the child and any of the risk factors for childhood unintentional injury. AU the other risk factors were significantly associated with at least one other factor. The significant associations (using either a χ^2 test, with Yates correction or Fisher's exact test 2 tailed p value where appropriate) are shown below in Table 3.3 on the next page. Even accounting for multiple significance testing by taking a lower significance level (e.g. $p \leq 0.01$) aU the factors are still sigruficantly associated with at least one other factor.

Table 3.3 Significant associations between risk factors for childhood unintentional injury.

	Age	Family size	Ethnic group	Single parent	Employment	Tenure	Car	Benefits	Young mother	Previous injury	Deprived area
Age				p=0.02	p=0.02			p=0.01		p<0.001	
Family size			p=0.01	p=0.003		p<0.001	p=0.004	p=0.005			
Ethnic group										p=0.002	p=0.04
Single parent						p<0.001	p<0.001	p<0.001	p<0.001		p=0.001
Employment						p<0.001	p<0.001	p<0.001	p<0.001		
Tenure							p<0.001	p<0.001	p<0.001		
Car								p<0.001	p=0.004		
Benefits									p<0.001		p=0.02
Young mother											
Previous injury											
Deprived area											

3.3.7 Prevalence of outcome measures

Forty seven children whose parents had responded to the original questionnaire had left the practice during the one year follow up period (8.0%). Resuhs are therefore presented for the 540 children still registered at the practice (92.0%). Of these 540 chUdren, 96 (17.8%) had at least one attendance for an unintentional injury over the foUow up year. Of these 96 chUdren, 64 had only one attendance (11.9%), 25 had 2 attendances (4.6%), 5 had 3 attendances (0.9%) and 2 had 4 attendances (0.4%). Four children (0.7%) were admitted to hospital during the year foUowing an urùntentional injury. Therefore a total of 141 attendances for injury occurred, givîng an unintentional injury attendance rate of 261 attendances per 1000 children per year. Eight of the 141 attendances involved attendance at the primary health care team and the accident and emergency department for the same injury. In total, 133 medicaUy attended injuries occurred giving an unintentional injury rate of 246 injuries per 1000 children per year.

Fifty five chUdren (10.2%) had 70 attendances at the primary health care team over the one year period. Forty two (7.8%) had only one attendance, 11 (2.0%) had 2 attendances and 2 (0.4%) had 3 attendances. The injury attendance rate for the PHCT is therefore 130 attendances per 1000 children per year.

Sixty children (11.1%) attended the accident and emergency department, having a total of 67 attendances. The injury attendance rate was therefore 124 per 1000 children per year, extremely similar to the PHCT injury attendance rate. Fifty three children (9.8%) attended the A & E Department once in the year and 7 (1.3%) attended twice. Of the sixty children attending A & E at least once, 21 also attended the PHCT at least once in the year following a separate injury event. Only 4 (0.7%) chUdren were admitted to hospital during the year long foUow up. One of the chUdren who was admitted had also been to A & E at least once in the year and two had been to the PHCT following an injury at least once in the year.

Of the 166 non responders to the original questionnaire, 23 left the practice during the foUow up year. Of the remaining 143 chUdren, 35 had a total of 51 attendances at a health care facUity foUowing separate unintentional injuries. The unintentional injury rate amongst the non responders was therefore 357/1000 children per year. There was no significant difference in the proportion of responders (17.8%) and non-responders (24.5%) injured during the year
(χ^2= 3.27, 1 degree of freedom, p=0.07).

The distribution of injuries requiring medical attention by the health care facility attended are shown in Table 3.4 below. Injuries are classified by place of first presentation. Of the eight children who attended the primary health care team and the accident and emergency department with the same injury, three were suffering from sprains, two had fractures, two had lacerations and one had bmising.

Table 3.4 The number of injuries presenting to the primary health care team, the A&E department and being admitted to hospital over a one year period October 1993-September 1994 (% of total attendances by each health care facility).

Injury	PHCT attendance	A&E attendance	Admission
Bmising	27 (38.6)	10(14.9)	0
Laceration	18(25.7)	14 (20.9)	1
Sprain/strain	15(21.4)	10(14.9)	0
Fracture	2 (2.9)	16(23.9)	1
Dislocation	1 (1.4)	0	0
Bum/scald	1 (1.4)	0	0
Poisoning	0	3 (4.5)	0
Foreign body in orifice	0	1 (1.5)	0
Concussion/head injury	1 (1.4)	7 (10.4)	2
Bite/Sting	3 (4.3)	0	0
No injury diagnosed	2 (2.9)	0	0
Injury unknown/not recorded	0	6 (9.0)*	0
Total	70	67	4

* Six children who attended the accident and emergency department did not wait to be seen, therefore the injury was not known.

The Abbreviated Injury Scale (Association for the advancement of automative medicine 1990) score was able to be calculated for 91 of the 96 children with an unintentional injury. Three children attended the accident and emergency department following poisoning or suspected poisoning, which being non-traumatic is not coded by the AIS 90. All three were discharged home without any treatment. One child attended the accident and emergency department with a foreign body in his thumb. Once again this could not be coded. The foreign body was removed and the child discharged home without any follow up. One child attended with no injury diagnosed. The inabUity to score these injuries is unUkely to significantly alter the resuhs as data from the clinical notes suggests the injuries were minor. None of the children suffered injuries in more than one body area, therefore the ISS (injury severity score) was not calculated from the AIS. For chUdren with multiple attendances, the mjury with the highest AIS score was used in the analysis. All six children who attended the accident and emergency department but who did not wait to be seen, and who therefore did not have a diagnosis, had other attendances during the one year period in which diagnoses were made which were able to be scored. These scores were therefore used in the analysis. The AIS scores ranged from 1 to 3, with 87% (79) of the injuries scored as one, 11% (10) scored as two and 2% (2) scored as three, illustrating that the majority of injuries were minor. No significant association was found between any of the risk factors and injury severity score.

3.3.8 The relationship between risk factors and injury outcomes

Three outcome measures have been used in this analysis, primary health care team attendances for injury, A & E department attendances and all attendances. Hospital admissions for injury were not used as a separate outcome as only 4 children were admitted to hospital during the one year follow up period. Analyses have been undertaken using a binary measure for each of these outcomes, i.e. no primary health care team attendance versus one or more attendances. Analyses have also been undertaken comparing the mean number of attendances for unintentional injury by the various risk factors. Cases with missing data on a variable have been excluded from the analysis.

3.3.8.1 Univariate analyses for unintentional injury attendances at the primary health care team, accident and emergency department and at any health care facility

The resuhs of the univariate analyses are shown in Table 3.5 below. It demonstrates that previous medically attended urúntentional injury was significantly associated with all three outcomes. Male sex was significantly associated with accident and emergency department attendance.

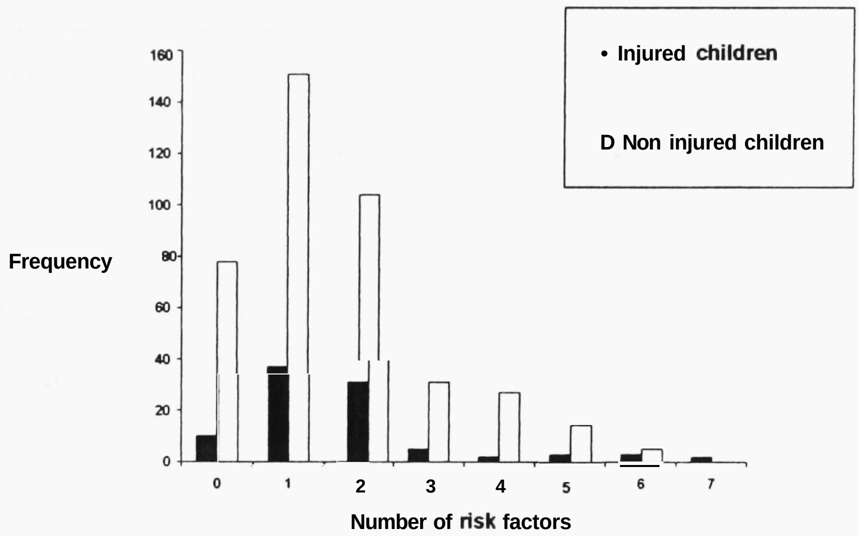
Table 3.5 Relative risk of primary health care team attendance, accident and emergency department attendance and attendance at any health care facility for unintentional injury, by univariate analyses of risk and sociodemographic factors (95% confidence interval).

Risk or socio-demographic factor	Number	PHCT attendance	A&E attendance	All attendances
Male sex	292	1.08(0.65,1.79)	1.68(1.01,2.80)	1.19(0.82,1.74)
Age<5	187	1.0(0.59,1.70)	0.80(0.49,1.29)	0.97 (0.66, 1.41)
≥4 children in family	62	1.29(0.64,2.62)	1.3(0.67,2.53)	1.18(0.69,2.00)
Single parent famUy	57	1.95(0.98,3.87)	0.92(0.41,2.04)	1.06(0.59,1.88)
Non-owner occupier	62	1.27(0.63,2.58)	0.44(0.14,1.36)	0.92(0.5,1.69)
No access to car	37	1.05(0.4,2.77)	0.73(0.24,2.23)	0.77(0.33,1.8)
Ethnic group non white	22	0	0.4(0.06,2.74)	0.25(0.04,1.69)
Receipt of benefits	79	1.39(0.74,2.59)	0.66(0.26,1.49)	0.99 (0.57, 1.67)
Maternal age ≤20	35	0.79(0.26,2.43)	0.7(0.23,2.19)	0. 8.(0.34, 1.85)
Previous injury	239	1.79(1.06,3.02)	1.64(1.01,2.68)	1.52 (1.04, 2.21)
Overcrowding	28	1.7(0.73,3.98)	0.65(0.17,2.55)	1.01 (0.44, 2.32)
Unemployment	20	1.43(0.48,4.25)	0.47(0.07,3.21)	1.11 (0.44, 2.77)
Townsend score > 0	97	1.28(0.71,2.31)	1.01(0.84,1.9)	107(0.67, 1.71)

The number of risk factors for injured children ranged from none to seven.

Figure 3.1 below shows the distribution of risk factors in injured and noninjured children.

Figure 3.1 The distribution of risk factors in injured and uninjured children



Children who had missing data on any risk factor were excluded from the calculation of the number of risk factors. Most of the injuries occured amongst children with few risk factors; 84% percent of the children with injuries had two or fewer risk factors, a similar percentage as that for uninjured children (81%). The distribution of risk factors did not differ significantly between injured and uninjured children (χ^2 = 5.46, 4df, p=0 24).

Sample size calculations undertaken after the data coUection based on a 5% significance level, a power of 80% and the actual primary health care team and accident and emergency department attendance rates found in the study, demonstrate that the sample size was adequate to detect relative risks of the order of two for most risk factors for the outcome of all attendances for unintentional injury. The relative risks detectable by the study for each of the outcome measures are shown in Table 3.6 below.

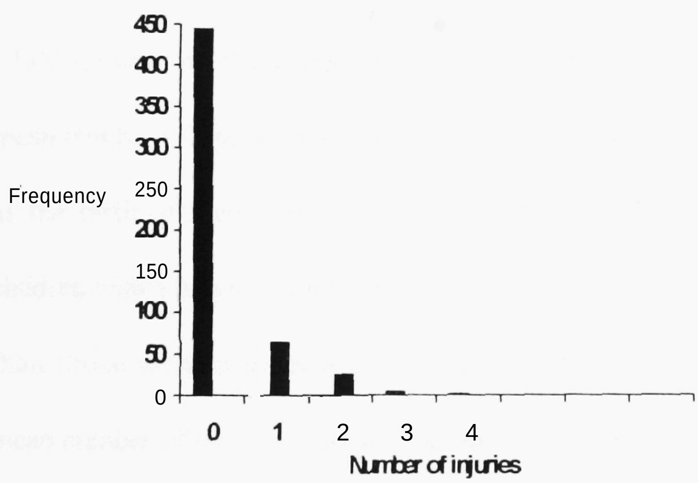
Table 3.6 Relative risk (RR) detectable by the achieved sample size for each outcome measure based on 80% power and a 5% significance level.

Risk factor	No of children	RR detectable for PHCT attendances	RR detectable for A&E attendances	RR detectable for all attendances
Male sex	292	1.91	2.02	1.65
Age<5	187	1.91	1.91	1.63
≥4 children	62	2.44	2.34	1.94
Single parent	57	2.80	2.33	1.83
Non-owner occupier	62	2.43	2.26	1.94
No car	37	2.80	2.68	2.20
Ethnic group non white	22	3.35	3.35	3.30
Receipt of benefits	79	2.29	2.12	1.84
Matemal age ≤20	35	2.78	2.72	2.22
Previous injury	239	2.11	1.99	1.72
Overcrowding	28	3.15	2.95	2.40
Unemployment	20	3.60	3.35	2.65
Townsend score > 0	97	2.24	2.18	1.82

3.3.8.2 Univariate analysis by mean number of injuries for each risk factor

As the binary outcome measures of attendance or no attendance at a health care faciUty do not fully describe the injury experience of children suffering more than one medically attended unintentional injury, analyses using the mean number of injuries by risk factor group have been undertaken The distribution of the number of injuries per child over the one year follow up period is clearly skewed to the left, and is shown in Figure 3.2 below.

Figure 3.2 The distribution of the number of injuries per child over a one year period.



As a resuh of the non normal distribution of the number of injuries, the data have been transformed by calculating the square root of the number of injuries plus one and substituting this for the number of injuries in subsequent analyses (Snedecor 1956). This transformation was chosen in preference to a logarithmic transformation in view of the shortness of the tail of the distribution, as demonstrated in the figure above. The mean number of injuries and the standard deviation were calculated for children having and not having each risk factor. Unpaired t-tests were then undertaken on the transformed data. Where the observed significance level for the F test (testing the hypothesis that the variance for each group is equal) is below 0.05 (i.e.the variances are not equal) the separate variance estimate has been used. Where the observed significance level for the F test is above 0.05 the pooled variance estimate has been used.

Based on calculations using the transformed data, children from families classifying themselves as white had a higher mean number of injuries (mean 1.06) than children from ethnic minority groups (mean 1.02) (t=2.04, 39 df, p=0.05). Children with mothers aged over 20 at the birth of their first child had a higher mean number of injuries (mean 1.10) than children with mothers aged 20 or under at the birth of their first child (mean 1.05) (t=-2.60, 468 df, p=0.01). Finally chUdren with a previous injury had a higher mean number of injuries (mean 1.10) than those without previous injury (mean 1.04) (t=2.77, 445 df, p=0.006). The mean number of mjuries, standard deviation and t test results are shown for each risk factor in Appendix D.

3.3.9 **Multivariate** analysis.

3.3.9.1 Binary outcome measures.

It has already been demonstrated that there are significant associations between many of the risk factors for childhood unintentional injury. In view of this, the relationship between the various risk factors and each of the three outcome measures (aU attendances, attendance at the PHCT and attendance at the A&E department) has been examined after adjusting for the effects of the other independent variables using logistic regression analysis. Variables were entered into the model using three methods; forward, backward, and entering all independent variables into the equation on one step. The model obtained using each of these methods contained ordy previous injury for the outcomes of all attendances and primary health care team attendances, and male sex and previous injury for A&E attendance, i.e. the variables significantly associated with the outcomes on univariate analysis remained sigrùficantly associated with the same outcomes on multivariate analysis. The adjusted odds ratios for the independant variables significantly associated with each outcome are shown in Table 3.7 below.

Table 3.7 Adjusted odds ratios (and 95% confidence intervals) for independent variables significantly associated with the outcomes of attendances at the primary health care team, attendances at A&E and all attendances for injury.

Independant variable	PHCT attendances	A&E attendances	All attendances
Male sex		2.13(1.06,4.20)	
Previous injury	2.58(1.33,5.00)	2.27(1.15,4.40)	2.33(1.37,4,05)

3.3.9.2 Assessing the goodness of fit of the models

The goodness of fit statistics for each of the models are shown in Table 3.8 below. It demonstrates that the variables significantly associated with the outcomes had a significant, but only small, effect on the goodness of fit of the models. For each of the final models, the χ^2 test of the hypothesis that the model differs significantly from the "perfect model" cannot be rejected.

Table 3.8 Goodness of fit statistics for the models for attendances at the primary health care team, at A&E and all attendances.

	PHCT attendance	A&E attendance	All attendances
% classified correctly by model	89.8%	88.8%	82.2%
- 2 log likelihood (constant only)	348.5	369.3	494.6
- 2 log likeUhood (final model)	342.4	360.7	487.8
Improvement (χ^2 test)	6.08 (1df, p=0.01)	8.57 (1 df, p=0.01)	6.82 (1df, p=0.009)
Goodness of fit (χ^2 test)	528.0 (526 df, p=0.47)	525.0 (523 df p=0.47)	528.0 (526 df,p=0.47)

The regression equation for attendance at the primary health care team contained only history of previous injury. The equation for the probability of future primary health care team attendance is;

Z= -0.97 - 0.71 (no previous injury)

and the probability of fiiture attendance at the primary health care team if no history of previous unintentional mjury is 0.16, and is 0.27 where there is a history of previous unintentional injury.[1]

[1] Calculated using the formula:
Probability = $\frac{1}{1+e^{-z}}$

The regression equation for attendance at the accident and emergency department contained the variables sex and previous injury:

Z= 0.05 - 0.82 (female sex) - 0.63 (no previous injury)

The probability of fiiture accident and emergency department attendance for a female without previous injury is 0.20, whereas the probability of future attendance for a male with a previous injury is 0.52.

The regression equation for all attendances containing only previous injury is:

Z = -0.30 - 0.73 (no previous mjury)

therefore, if there is no previous injury, the probabUity of attendance for future injury is 0.26, whereas if there is a history of previous injury the probability of fiiture attendance = 0.43.

3.3.9.3 Using the number of injuries as the outcome measure

Univariate analysis using the number of injuries as the outcome measure demonstrated that previous injury, matemal age and ethnicity were significantly associated with the number of injuries. In order to adjust for the effect of confounding, multiple Unear regression analysis was undertaken. Three methods were used to buUd the model; forward selection, stepwise selection and backward elimination. Each method produced the same resuh, with matemal age and previous injury being independantly associated with the number of injuries. This is shown in Table 3.9 below.

Table 3.9 Regression coefficients for variables independantly associated with the number of injuries over the one year follow up period.

Independant variable	Regression coefficient B	SE (B)	t	p value
Maternal age ≤20 at birth of first chUd	-0.12	0.05	2.14	0.03
Previous injury	0.09	0.03	3.4	0.007

The final regression equation obtained is:

The predicted number of injuries = 0.99 - 0.12 (matemal age ≤20 at birth of first child) + 0.09 (previous injury).

Therefore for a child with a mother aged under 20 at birth of first child without a history of previous injury the predicted number of injuries is 0.87 in the subsequent year. For a child with a mother aged over 20 who has had a previous injury, the predicted number of injuries in the subsequent year is 1.08.

The adjusted R^2 coefficient for the model containing only previous injury was 0.02. This increased to 0.03 with the addition of matemal age in the final model

The F test testing the null hypothesis that there is no linear relationship between previous injury, maternal age and the number of injuries can be rejected (F=7.47 p=0.0007). However previous injury and matemal age explain orUy 3% of the variation im the number of mjuries, suggestimg that most of the variation in number of injuries is explained by factors other than those examined in this study.

3.3.10 Sensitivity, specificity and positive predictive value of risk factors for predicting future injury

The sensitivity, specificity and positive predictive value for each of the risk factors in predicting which children wiU experience injury are shown in Table 3.10. It demonstrates that whilst the specificity is high, the sensitivity and poshive predictive value is low for most factors An estimation of the number of children needed to treat to prevent one injury has been calculated based on an estimated 10% reduction in injury frequency following an intervention, which is similar in magnitude to the reduction in injury frequency found in previous studies of primary care based intervention programmes (Bass et al 1991, Kravitz 1973).

Table 3.10 The sensitivity, specificity and positive predictive value (PPV) of risk and sociodemographic variables for predicting future injury and the number of children in each risk factor group needing to be targeted with injury prevention to prevent one injury.¶

Risk factor	**Sensitivity (Vo)**	**Specificity (%)**	**PPV**	**Number needed to treat** (95% CI)
Male sex	59.4	46.8	19.5	38(24,52)
Age under 5 years	35.4	65.5	18.2	38(27,49)
≥4 children in family	13.7	88.9	21.0	27(21,33)
Single parent family	11.6	89.2	19.2	25(19.31)
Non-owner occupiers	10.7	88.0	16.1	43(36,50)
No access to car	5.3	92.6	13.5	33(28,38)
Receipt of benefits	14.9	84.9	17.7	30(23,37)
Ethnicity	1.1	95.0	4.5	25(17,33)
Matemal age ≤20	5.8	92.2	14.2	34(29,39)
Previous injury	57.4	57.4	22.6	29(20,38)
Overcrowding	5.3	94.8	17.9	54(49,59)
Unemployment	4.2	96.4	20.0	50(46,54)
Townsend score > 0	21.1	80.5	19.6	34(26,42)
Whole population				38(18,58)

¶ based on an estimated reduction in injury frequency of 10% following a primary care intervention.

3.3.11 Summary of results

The main findings from this study are:

1. The medically attended unintentional injury rate in children during a one year period was 246 injuries per 1000 children whose parents completed the questionnaire and 357 per 1000 children whose parents did not complete the questionnaire. The proportion of children injured did not differ significantly between those whose parents responded and those whose parents did not respond. Children of non responders were however significantly more likely to have a history of previous injury, but this response bias is unlikely to have substantially altered the results.

2. The distribution of injuries presenting to the primary health care team and the accident and emergency department was similar to that found in previous studies.

3. The majority of injuries were minor. There was no significant difference in injury severity score by any of the risk factors.

4. This study was unable to replicate the findings from previous studies concerning associations between most risk factors for injury and injury outcomes. Previous medically attended injury was significantly associated with attendance at any health care facility and attendance at the primary health care team. Previous injury and male sex were both significantly associated with attendance at the accident

and emergency department. Adjusting for the effect of the other independent variables in a logistic regression analysis did not alter these results.

5. Previous injury, matemal age and ethrucity were significantly associated with a higher mean number of injuries. After adjustmg for the effect of other independent variables with multiple regression analysis, only previous injury and matemal age remained significantly associated with the number of injuries.

6. The sensitivity and positive predictive value for all factors except male sex and previous injury in predicting future injury were low. The specificity for most factors in predicting future injury was high. The number of children needed to treat to prevent one injury was similar for all risk factors and was also similar to the number needing an intervention if a population approach were to be used.

3.4 Discussion

There are several methodological issues requiring consideration before further discussion of the resuhs. Firstly the representativeness of the responders to the questionnaire and secondly the validity and reliability of the questionnaire These issues will be discussed below.

3.4.1 Representativeness of the children whose parents responded

Previous work suggests that responders to postal questionnaires often differ from non- responders in terms of demographic and socioeconomic factors such as age, sex, social class, ethnicity and single parenthood (Streiner and Norman 1995, Cartwright 1983). It is therefore possible that the parents of children most at risk of injury may have been less likely to respond to this survey. A response bias did occur whereby female children and older children with a history of previous medically attended injury were under-represented among the responders. Also, the unintentional injury rate over the follow up year was higher in children of non responders. The injury rate among children of responders is however similar to that found in previous studies in primary care and A&E settings (Department of Trade and Industry 1996, Agass et al 1990, Steele et al 1994), so it is unlikely that response bias will have a major effect on the results. Assuming that all children of non-responders had a history of previous medically attended injury and experienced the injury rate for non-responders found in this study, the relative risk for a future injury in those with a history of previous injury would increase from 1.79 to 2.05, which would not substantially alter the results.

3.4.2 Validity and reliability of the questionnaire

The 1 in 10 sample of notes of children whose parents responded provided data on age, sex, previous medically attended injury and postcode (used for residence in a deprived ward) for the purposes of validating the responses given on the questionnaire. Data on age, sex, previous medically attended injury and postcode were available for 100% of the sample and complete concordance was found between the information given on the questiormaire and that obtained from the medical records for age, sex and postcode. For medically attended unintentional injury, 28 parents reported no injury and none was found in the medical records and 22 reported an injury which was confirmed from the medical records. The parents of six children did not report an injury, but one was found in the medical records and for two children the parents reported an injury which could not be found in the records. The kappa coefficient for medicaUy attended injury was 0.81, which would be classified as "almost perfect agreement" using the classification devised by Landis and Koch (Landis and Koch 1977).. This suggests that the responses to the questiormaire were valid, at least for the questions for which some external means of validation was possible.

The test-retest procedure carried out on a separate sample of mothers from a child health clinic in a location with a similar socioeconomic profile suggests the reUabUity of the questions was high with twelve of the fourteen questions showing complete concordance (kappa=1). Kappa coefficients for the two questions without complete concordance were 0.87 and 0.91.

Previous studies usmg questiormaires or structured interviews for the assessment of risk factors for childhood urintentional injury, have not provided detaUs of the testing of their instruments for validity and reliabUity (Bijur et al 1988a, Bijur et al 1988c, Roberts and Norton 1995) other than for assessing the validity of self reported medicaUy attended urúntentional injury. Agass and colleagues compared the responses to a questiormaire with data recorded in the primary care medical records and found that 91% of the injuries reported by parents were recorded in the medical records (agass et al 1990). Braun and colleagues reported validation rates for self reported injuries in young aduhs of 87% and 75% in two samples. AU unvaUdated events were the resuh of being unable to find the medical records, not of inaccurate self reporting (Braun et al 1995). The sensitivity and specificity of self reported injury was found to be highest within six months of the injury occurring. Both these studies suggest that self reports of injury, especiaUy within a short tune period are Ukely to be relatively accurate. The validation exercise and reUabUity testing undertaken during this study and the findings of previous work therefore suggest the questionnaire was a valid and reliable tool for eliciting data on risk factors for childhood uruntentional mjury.

3.4.3 Possible explanations for failure to find an association between risk factors and unintentional injury

One of the maim findings from this study was that it was not possible to replicate the associations previously found between risk factors for childhood injury and a range of injury outcome measures, other than for previous medically attended mjury and male sex. This is an important finding, the possible reasons for which need consideration, as the implication of the findmgs is that primary care injury prevention should not, at, present, be targetted at high risk children.

There are four possible explanations for the lack of any associations; chance, bias, confounding and that no associations exist. Each of these possible explanations will be discussed below.

3.4.3.1. Chance

A posteriori sample size calculations based on the actual number of children in each risk factor group and the proportion of children without the risk factor who experienced an injury in the follow up year, suggests that the study had 80% power at the 5% significance level to detect a relative risk of future injury of less than 2 for male sex, four or more children in family, non-owner occupation, receipt of means tested benefits and previous medically attended injury. As attendance at the primary health care team and at the accident and emergency department were less common outcomes, the study was only able to detect larger relative risks for these outcomes. Previous studies have found relative risks of this magnitude (i.e. 2 or less) for some risk factors. The "Thousand Family study" in Newcastle upon Tyne found the injury rate per child per year in the first 5 years of life to be double that in the next ten years of Ufe (Miller et al 1974) The Child Health and Education Study found the relative risk of at least one medically attended unintentional mjury for chUdren with mothers below the age of 20 at the birth of the first child to be 1 82 (Stewart-Brown et al 1986). Roberts found the odds ratio for pedestrian injury in European children of single parent families to be 3.13 (Roberts 1994). Several authors have found the relative risk of injury in children with a previous medically attended injury to be two or greater (Bijur et al 1988a, Mahheimer et al 1966, Eminson et al 1986, SeUar et al 1991). Data from the Home and Leisure Accident SurveiUance Systems demonstrates accident and emergency department attendance rates in boys to be 1.3 times that of girls for home injuries and 1.7 times that of girls for leisure injuries (Department of Trade and Industry 1996). FinaUy Constantinides found the accident and emergency department attendance rates to be four times higher for children living in deprived wards (Constantinides 1988). It therefore seems unlikely that a type II error can explain the lack of association found between most risk factors and the outcome of at least one medicaUy attended injury.

3.4.3.2. Bias

A response bias occurred whereby the children of parents who responded were different from the chUdren whose parents did not respond with respect to previous medicaUy attended injury, with non responders being more likely to have an injury recorded in their medical notes. As discussed above this is Ukely to lead to an underestimation of the relative risk of future injury among children with a history of previous injury. Estimations of relative risk based on the assumption that all non responders had a history of unintentional injury indicate that this underestimation would be small in magnitude and would not substantiaUy alter the results of this study.

The selection bias inherent in using a relatively affluent population for this study (Office of Population Censuses and Surveys 1993), may influence the abiUty of the risk factors to predict injury. It is possible that risk factors may not predict injury in the same way in an affluent population as they would in a less affluent population. The experience of poverty or disadvantage cannot be separated from it's social context, for example, non owner occupation in an affluent area may be a quaUtatively different experience (and one which carries a different risk of injury) from non owner occupation in a deprived area where other facilities such as safe play or leisure areas are less likely to be available.

One study has examined the association between mortality and deprivation based on the Townsend mdex and assessed the effect of using data on deprivation at the individual level. Sloggett and Joshi used multiple logistic regression analyses to calculate risk of death over a six year period using the Townsend index as an independent variable and each of the components of the index as independent variables (Sloggett and Joshi 1994). The association between the Townsend index and mortality for men was completely explained away by housing tenure, access to a car and regional zone of residence. They concluded that the excess risk associated with a disadvantaged area was entirely due to the concentration of people in that area with adverse personal or household socioeconomic factors and that disadvantaged individuals living within areas of relative affluence do not seem to be protected from the higher levels of mortality associated with disadvantage. Whether this findmg can be extrapolated to mjury morbidity, where environmental conditions such as the state of repair of the local housing stock or the availability of safe play areas and off street parking are important factors, is at present unknown. Further studies are needed with larger sample sizes and a wider cross section of the population to test the hypothesis that individual disadvantage is more important than community disadvantage in determiruing injury risk.

Much of the work on risk factors for unintentional injury originated from the Child Health and Education Study, which commenced 25 years ago and used a population comprising all children bom in one week. It is difficuh to make comparisons between the Child Health and Education Study population and that used in this study because of the development of new methods for measuring socioeconomic status and because of changes in social structure over the 25 year period. Some factors however, are directly comparable: the Child Health Education Study had less than 5% of their study population with 4 or more children in each family (Taylor et al 1983), compared to 11.8% in this study, less than 5% of the children came from single parent families (Stewart-Brown et al, 1986) compared to 9.7% in this study and 8.6% of mothers whose first child was bom before the age of 20 years (Wadsworth et al, 1983) compared to 6.5% in this study. Changes in social stmcture over the 25 year period may mean that single parenthood or young motherhood, for example, do not describe a similar group of people (with a similar risk of injury) today as 25 years ago Single parenthood is becoming increasingly common and single parents are an increasingly heterogeneous group in socioeconomic terms (Marsh and McKay 1994). Matemal age at birth of first chUd has risen over the same period (Wemer 1987). The ability of these factors to identify a group of children at high risk of injury may be different today.

A further difficulty with some of the indicators used in this study is that the presence or absence of the indicator may be less important than U's duration. For example, long term unemployment is Ukely to reflect very different socioeconomic circumstances than short term unemployment, these include increasing financial difficulty, increasing frequency of stressfùl life events, decreasing quality of the home environment, increasing social isolation and reduced self esteem (Bartley 1994), aU of which may be unportant in preventing childhood unintentional injury.

3.4.3.3. Confounding

Confounding occurs when a factor which influences the outcome under study is associated with the exposure of interest m the study Possible confounding factors in this study include proximity to hospital, matemal inexperience in dealing with injury and non accidental injury. There is evidence that proximity of residence to hospital influences accident and emergency department attendance rates (Lyons et al 1995, McKee et al 1990). If children with particular risk factors were more likely to Uve a greater distance from hospital, this could explain the lack of association between those factors and hospital attendance for injury. However, as the practice area is geographicaUy small and the distance to hospital short (4 miles by car or one bus journey), this is unlikely to explain the observed results. The second possibility is that inexperienced mothers may be more willing to consult following an injury for reassurance. However, the orUy association between matemal age and any of the injury outcomes was that children with older mothers suffered a greater number of fijture injuries. This is contrary to what would be expected if matemal inexperience was acting as a confoundmg variable. Thirdly a history of non accidental injury, or previous suspicion of non accidental injury could be a confoundmg factor. It is possible that parents who have previously been suspected of non accidental mjury may be less likely to report future unintentional injuries. At the time of this study, no children registered with the practice were on the ChUd Protection Register, so this also seems unlikely as an explanation for the resuhs.

Confounding may also have occurred as a result of the preponderance of minor injuries in this study. At low levels of injury severity, factors relating to health service utiUsation may confound the relationship between risk factors and occurrence of injury, when injury occurrence is measured using medically attended injuries. For example, lack of support with child care at home or lack of avaUabUity of transport may be related to single parenthood and to wUlingness to seek medical attention for minor injuries, so that single parents may present their children at A&E less often, not because their children have fewer injuries, but because it is more difficult to present to A&E if altemative sources of care need to be fovmd for other children, or if public transport has to be used. With injuries of greater severity, this is less likely to happen. It is therefore possible that only injuries above a certain injury severity threshold are associated with the risk factors discussed above. Walsh and Jarvis examined cases of moderate ($ISS \geq 4$) and severe mjury ($ISS \geq 9$) and death and found a significant association between socioeconomic status (measured by Townsend mdex) and injury, with the gradient being steepest for fatal injuries and least steep for more minor injuries (Walsh and

Jarvis 1992). More recent work, again from Newcastle using the Townsend index (Walsh et al 1996) faUed to replicate this finding, instead demonstrating a weaker correlation between Townsend score and more severe injuries than for all attendance and aU admission injuries. They conclude that a shift in admission threshold over the last five years may have altered this relationship by an increrasing number of chUdren with less severe injuries being admitted to hospital. However, the correlation between severe injuries and deprivation was not strong and the 95% confidence interval around the correlation coefficient included zero, indicating that the correlation coefficient for severe injuries was not sigruficantly different from zero. Changes in admission thresholds can not explain the lack of association between injury severity and deprivation for severe injuries where virtually all population cases wiU be represented, with little scope for selection bias. Further work is needed to investigate the relationship between area based maesures of deprivation and injury severity. The results of this study, should not, at present, be extrapolated to more severe injuries untU further work has addressed this issue.

3.4.3.4. No association exists

It is possible that there is no association between the risk factors (other than previous medicaUy attended injury and male sex) and the injury outcome measures used in this study within the study population. The demonstration of an adequate sample size to detect relative risks of less than two for five risk factors for the outcome of all attendances at a health care facility suggests insufficient power cannot explain the lack of association. Similarly bias and confounding as discussed above do not provide adequate explanations for the lack of association found. It is therefore possible that there is no association between these risk factors and these injury outcomes within this study population.

Three other recent studies of attendances at accident and emergency departments for unintentional injury have failed to find associations between area based measures of deprivation and attendance (Lyons et al 1995, McKee et al 1990, Ohn et al 1995) One study used a deprivation index designed for use in Scotland (Ohn et al 1995), the other two studies used the Townsend index (Lyons et al 1995, McKee et al 1990). Lyons and colleagues suggest that their failure to find an association may be explained by the ecological fallacy whereby the association found on an aggregate level does not necessarily represent the association found on an individual level. This may occur if the Townsend index does not describe areas which are homogenous in terms of the individuals living in those areas, in which case data at the level of the individual will be more useful than aggregate data. The lack of any associations between the individual components of the Townsend Index and any of the injury outcomes in this study does not support this hypothesis, but further work is needed with a larger sample size to examine the relationship between individual measures of deprivation and injury outcome, before any further conclusions can be drawn about the ecological fallacy.

There are two further possible explanations for the failure of each of these studies to demonstrate an association between socioeconomic status and injury occurrence. Firstly as already discussed with reference to this study, the association between socioeconomic status and injuries may exist only above a certain injury severity threshold. However, Lyons and colleagues also examined the relationship between more severe injuries (those resulting in fractures) and socioeconomic disadvantage and despite large numbers still failed to find an association (Lyons et al 1995).

The second possible explanation is that the measures of socioeconomic status used are unable to describe groups of people with differing risks of injury. Why might measures of deprivation which have repeatedly explained large amounts of variation in mortality, morbidity and heahh service utilisation not be able to explain variations in injury morbidity, despite a steep and widening social class gradient in injury mortality (Roberts and Power 1996, Office of Population Censuses and Surveys 1995)?

Changes in Government policy over the last 15 years will have influenced the characteristics of the people described by the component variables in composite measures of deprivation. For example, housing tenure and unemployment are two of the component variables comprising the Townsend score, which will have been greatly influenced by recent Government policy. The selling of Local Authority housing stock means that non owner occupiers are a different group of people than those not owning their own home 15 years ago. The increase in unemployment rates, and the greater number of the long term unemployed, means that unemployment no longer describes the same group of people experiencing the same living conditions and life chances (Bartley 1994). Furthermore, the long and short term unemployed are lUcely to experience different risks of injury in terms of housing repair, avaUabUity of local amenities such as safe play areas and leisure facUities or off street parking. Given the steep social class gradient with injury mortality it is unlikely that socioeconomic status is not related to injury occurrence; but rather more Ukely that the tools we are currently using to measure socioeconomic status are not describing groups who are homogenous in terms of injury risk.

3.4.4. Using risk factors to identify high risk groups

The resuhs of this study suggest that the majority of risk factors have a low sensitivity and specificity for identifying children who will go on to have future medicaUy attended unintentional injury. Consequently many chUdren who wiU have a fiiture injury wiU be missed by this method, whilst many who will not have a future injury will be falsely identified as being at high risk. This is illustrated in Figure 3.3 below, using previous injury as the factor identifying a child as high risk, the proportion of chUdren experiencing an unintentional injury in the one year follow up period (17.8%) and the sensitivity (57.4%) and specificity (57.4%) for previous injury in identifying future injury found in this study, and based on the population of Nottingham Health District (Office of Population Censuses and Surveys 1993).

Figure 3.3 Impact of identifying children at high risk of injury based on previous unintentional injury, for Nottingham Health Disctrict.

District population = 41,000 children under 5 years

↙ \

7298 unintentionally injured children (17.8%)	33702 uninjured children (82.2%)

↙ \ ↙ ↘

4189 correctly identified children	3109 missed injured children	19345 correctly identified uninjured children	14357 false positives

Therefore for every 4 children correctly identified, three children who wiU have injuries will be missed, and 14 children wiU be identified as being at high risk but will not have an injury. At the district level, this would involve foUowing up 18,500 children to potentially prevent 4,000 children being injured. Previous primary care based injury prevention programmes have demonstrated reductions in injury frequency of 10-20% (Bass et al, Kravitz). Using 10% as the estimated effectiveness of a prevention programme Ulustrates that 18,500 children would need to be reached with a targetted injury prevention programme to prevent 400 chUdren beïng injured, or 46 chUdren per injury prevented. If a whole population approach was used, 41,000 children would need to be reached by an injury prevention programme to prevent 730 children being injured, or 56 children per injury prevented.

The resource impUcations of such a risk management approach to childhood urintentional injury would be great. A system would need to be estabUshed to coUect risk factor data as this is not routinely available in primary care. FoUowing data collection resources would need to be invested in a system to identify high risk children. Previous risk management programmes for non-accidental injury have demonstrated that risk status is not stable over time (Browne and Saqi 1988), hence monitoring of risk status would also need to take place, in conjunction with increasing or decreasing injury prevention input with changes in status. Browne and Saqi suggest that such an approach should be used for non-accidental injury, and that in view of the high rate of false positives, a second screening procedure should be used on those identified as high risk, to reduce the false positive rate. Such a system would incur extra resource usage. This must be taken into account when considering the relative merits of the two approaches.

The difference between the targeted approach and the population approach is smaU in terms of the number of children needed to treat, but the overall impact in terms of reducing injury morbidity in the district is greater with the population approach because a proportion of the injuries occurring in the low risk group could also be prevented. This iUustrates the point made by Rose that prevention aimed at those at high risk will be limited in terms of reducing the burden of iU health, as much ill health occurs to those at lower risk (Rose 1992).

The smaller number needed to treat to prevent one injury in the high risk group indicates that the benefits of prevention will be greater to those at high risk than those at lesser risk. This has important implications for injury prevention programmes as those at lesser risk may be less motivated to take part, as they can see relatively little individual benefit in doing so. If those at lesser risk will not participate in injury prevention, this will reduce the potential effectiveness of a population approach. Incorporating injury prevention into the present child health surveillance system operating in primary care might be one way of ensuring high uptake amongst those at lesser risk, as previous work suggests this service is used by parents who would be considered low or moderate risk for childhood unintentional injuries (Zinkin and Cox 1976, Moss et al 1986).

For some injury prevention activities, the externalities resulting from an individuals action will be relatively obvious, e.g. car owning families supporting a local traffic calming scheme will reduce the risk of pedestrian injury not only to their children, but also to the children living in that area whose families do not own a car, and who may therefore be more exposed to traffic and hence have a greater risk of pedestrian injury. For other injury prevention activities it will be more difficult for low or moderate risk patients to conceptualise that if for example, they purchase and use a smoke alarm they will be helping to reduce the burden of morbidity and mortality from house fires among those families at higher risk, as individual actions such as this may contribute towards changing the culture of safety within a community and hence Unpact on those at higher risk. In this way, the population approach encompasses the notion of individual responsibility for a community, in direct contrast to the individualised stance of the high risk group approach. This may present problems for primary health care teams delivering injury prevention who currently focus very much on the mdividual at the expense of the community, as discussed in the next study presented in this thesis. A successful population approach therefore will require a cultural change not only amongst parents and children, but also amongst those delivering prevention in primary care.

3.5. Conclusions and implications of this study for injury prevention practice

The failure of this study to find significant associations between risk factors for injury and a range of injury outcome measures suggests that at present injury prevention programmes in primary care should not be targeted using these risk factors until further work has confirmed or reflated this finding in a larger population with a wider cross section in terms of socioeconomic status. It is unlikely that this study failed to detect strong associations between these risk factors and injury outcome. High values for sensitivity and positive predictive value for each risk factor would only be obtained if the association between the factor and the injury outcome was strong. It is therefore unlikely that even if larger studies did find associations this would substantially aher the conclusions regarding using risk factors for targeting injury prevention in primary care. The resuhs of this study cannot, however, be extrapolated to more severe injuries, and further work is needed in this area.

This study therefore supports previous suggestions that targeting injury prevention at groups of high risk children is not efficient in terms of the number of children needed to be targeted and the potential number of injuries prevented in that group of children. As children have repeated contacts with members of the primary health care team, especiaUy in the first five years of life it is suggested that injury prevention programmes should use a population approach, certainly until further work either confirms or refutes the lack of association found between previously demonstrated risk factors and childhood unintentional injury.

Chapter 4

The role of the primary health care team in childhood unintentional injury prevention

4.0 The role of the primary health care team in childhood unintentional injury prevention

4.1 Objectives

The objectives of this study are:

to assess the knowledge of chUdhood unintentional injury epidemiology amongst general practitioners, health visitors and practice nurses.

to assess attitudes towards chUdhood unintentional injuries amongst general practitioners, health visitors and practice nurses, and

to assess current practices in childhood unintentional injury prevention amongst general practitioners, health visitors and practice nurses.

4.2 Method

4.2.1 Study setting and study population

The study was conducted in Nottinghamshire in 1994. The sampUng frame for the study population included general practitioners on the Ust of the Nottinghamshire Family Health Services Authority, their practice nurses and health visitors employed by Nottmgham Community Health NHS Tmst and by North Nottinghamshire Community Health NHS Tmst.

4.2.2 Sample size

The above sampUng frames included a total of 487 general practitioners, 322 practice nurses and 210 health visitors. A one hundred percent sample was used for each sampling frame.

4.2.3 Questionnaire development

The questionnaire consisted of four sections. The first consisted of attitudmal statements concerning mjury prevention activities including those suggested by the Health of the Nation as bemg part of the role of the primary health care team (Department of Health 1993 a). Other injury prevention activities which have previously been discussed as part of the roles of the various team members in the published Uterature, were also mcluded in the questionnaire e.g. health vishors undertaking post accident follow-up visits, or general practitioners giving advice during consultations for acute injury (Department of Health 1993a, Laidman 1987, Levene 1992, Lowe 1989, Ehiri and Watt 1995, Carter et al 1992, Greig 1987, Carter and Jones 1993a, Carter et al 1995, Leveque et al 1995, Bass et al 1993, Coombes 1991, Kendrick 1994b, Colver et al 1982, Morgan and Carter 1996b, HaU 1996, Kay 1989, Reynolds 1996). Possible responses ranged from strongly agree to strongly disagree on a five pomt Likert Scale. The attitudmal statements consisted of a nüxture of positive and negative statements.

The second section of the questionnaire consisted of questions concerning current practice again concerning those activities suggested in the Health of the Nation and the pubUshed Uterature on the roles of the team members in chUdhood unintentional injury prevention (Department of Health 1993a, Laidman 1987, Levene 1992, Lowe 1989, Ehiri and Watt 1995, MacInnes 1985, Carter et al 1992, Greig 1987, Carter and Jones 1993a, Carter et al 1995, Leveque et al 1995, Bass et al 1993, Coombes 1991, Kendrick 1994b, Colver et al 1982, Morgan and Carter 1996b, HaU 1996, Kay 1989, Reynolds 1996). Three types of questions were used; the first assessing the frequency of various activities over a specified time period with possible responses from always to never on a five point Likert scale with a not applicable category. The second type of question assessed whether the respondent had ever undertaken certain activities over a specified time period with possible responses of yes, no or don't know. The third type of question assessed if any contact had occurred between the respondent and a wide range of agencies involved in injury prevention over a specified time period, with possible responses of yes or no. The questions assessing frequency of activities were aU worded as how often, if ever an activity was undertaken as an attempt to give permission to the respondent to report that an activity was never undertaken to try and reduce over-reporting of activity which has previously been demonstrated to occur with self reported preventive care (Lewis 1988).

The third section consisted of questions concerning knowledge of chUdhood unintentional injury epidemiology. This section was based on the Child Accident Prevention Tmst's 'picture of chUdhood accidents' questionnaire (Child Accident Prevention Tmst 1991b) which had been designed as an educational tool contained within a training resource for health visitors. Additional questions were added concerning the types of chUdhood injury most commonly requiring attendance at the accident and emergency department (Department of Trade and Industry 1993) and risk factors for childhood injury obtained from the pubUshed Uterature (Rivara 1982, Baker 1975, Bijur et al 1988a; 1988b; 1988c, Eminson et al 1986, SeUar et al 1991, Taylor et al 1983, Wadsworth et al 1983, Roberts and Power 1996, Alwash and McCarthy 1988, Constantinides 1988). The additional questions on the types of injury most commonly presenting to accident and emergency departments were added to make the questionnaire more locaUy appUcable as paediatric liaison health visitors worked in the departments at the local hospitals and notified the primary health care teams of some childhood injuries. The question conceming risk factors was added because it was anticipated that a future intervention study would be conducted in the same area which may require targeting interventions at chUdren considered to be at high risk of unintentional injury. This section of the questiormaire was identical for each of the professional groups.

The final section of the questionnaire consisted of questions on demographic and occupational detaUs, postgraduate qualifications, and details of personal experience of injury in the respondents own children. The general practitioner questionnaire also included questions on practice size, distance from the nearest accident and emergency department and inclusion in the FamUy Health Services Authority ChUd Health SurveUlance list. The sections of the questionnaire were deUberately ordered in this way to ensure those sections which may be perceived as most threatening, difficult or personal came at the end of the questiormaire in an attempt to encourage completion of the questionnaire.

4.2.4 Validity

Content vaUdity of the questionnaires was established by asking the views of a group of GP trainers and trainees, of practice nurses belonging to a local practice nurse educational group and a group of local health visitors. The ChUd Accident Prevention Tmst were also approached for advice on the content vaUdity of the questionnaire, as were members of the multidisciplinary multi-agency Nottingham Accident Prevention Group. Content validity conceming the injury prevention activities covered in the attitudinal and current practice sections was established as above but also by ensuring that all the activities suggested by the Health of the Nation and in a review of the literature on the roles of the primary health care team members in injury prevention were included (Department of Health 1993 a, Laidman 1987, Levene 1992, Lowe 1989, EhUi and Watt 1995, Carter et al 1992, Maclnnes 1985, Greig 1987, Carter and Jones 1993 a, Carter et al 1995, Leveque et al 1995, Bass et al 1993, Coombes 1991, Kendrick 1994b, Colver et al 1982, Morgan and Carter 1996b, Hall 1996, Kay 1989, Reynolds 1996).

The predictive vaUdity of the knowledge section of the questionnaire was assessed by measuring the responses of primary health care team members before and after a traming session which covered aU the areas mcluded m the questionnaire (Marsh and Kendrick 1997). It was not possible withm the timescale of the project to vaUdate the self reported current injury prevention practice. Discussions with local general practitioners, practice nurses and health visitors demonstrated that much injury prevention education even when undertaken was not routinely recorded m the medical or health visiting records, so making a comparison between recorded and reported activity unpossible. Observations of activity either by audiotaping or videotaping contacts either wdth patients or simulated patients was not possible within the timescale of the project. Patients and physician's reports of anticipatory injury prevention during weU chUd care have been found to significantly disagree; with parents reporting receiving sigruficantly less advice than physicians report givmg (Morrongiello et al 1995). Whilst physician overestimation may partly explain these resuhs, parental underestimation or poor recall may also play a part. Hence, parental reports were not considered appropriate to vaUdate the self reported practice of physicians.

4.2.5 ReliabUity

It was not considered appropriate to use the questionnaire for a test-retest procedure to assess reproducibUity of the responses as it was considered that undertaking the questionnaire the first time may raise awareness conceming childhood injuries which then influenced the responses on the second questionnaire. The consistency of the attitudinal statements was assessed by calculating correlation coefficients between each individual question and between the total score excluding the individual question and by calculating Cronbach's alpha coefficient (Streiner and Norman 1995).

4.2.6 Piloting

The questionnaires were pUoted on 20 general practUioner trainers and trainees, 10 practice nurses and 10 health visitors. There were no major changes to the questionnaire foUowing pUoting, ordy minor changes in wording to improve clarity.

4.2.7 Conduct of the survey

The names and addresses of aU general practitioners currently practising in Nottinghamshire were obtained from the Family Health Services Authority. The names of the practice nurses employed by each general practitioner were also obtained from the FamUy Health Services Authority via the practice nurse faciUtators. The names and contact addresses of all health vishors currently employed by the Community Tmsts in Nottingham and North Nottinghamshire were obtained from the Tmsts. The questiormaire was mailed with a stamped addressed envelope. Two further questionnaires were sent at two weekly intervals to non-responders. Questiormaires were sent to a total of 487 general practitioners, 322 practice nurses and 210 health vishors.

4.2.8 Data coding and Data entry

The questiormaires were precoded. The data were entered onto the SPSS-PC computer package (SPSS Inc 1990) twice and any discrepancies in the data checked by referral to the original questionnaires.

4.2.9 Analysis and statistical techniques

Attitudinal scores were computed by totalling responses to all statements. The coding for negative statements was reversed so that strong disagreement with a negative statement scored 5 and strong agreement scored 1. An overall score was then computed by totalling the responses to all statements. Questionnaires with missing data on any of the attitudinal questions were excluded from the analysis (n=4 for general practitioners, n=4 for practice nurses and n=6 for health vishors). Item total-item correlations were calculated for the purpose of excluding any attitudinal statements from the total score with a correlation of 0.2 or less with the total score, as such statements were not considered sufficiently correlated with the other items comprising the total score (Streiner and Norman 1995). Cronbach's alpha coefficient was also calculated to assess the consistency between responses to individual attitudinal statements (Streiner and Norman 1995).

A knowledge score was computed by assigning one to each correct answer giving a total possible score of twenty three. The correct responses to the knowledge questions was obtained from the information sheet for use wdth the questionnaire provided by the ChUd Accident Prevention Tmst (ChUd Accident Prevention Tmst 1991b), from the Office of Population, Censuses and Surveys Mortality Statistics (Office of Population Censuses and Surveys 1993 b) and from the Home Accident SurveiUance System data (Department of Trade and Industry 1993).

Comparisons of categorical data were made using χ^2 tests; comparisons of knowledge and attitude scores with personal, demographic and occupational characteristics were made using Marm-Whitney U tests as the scores were not normaUy distributed and correlations between knowledge and attitude scores were made using the Spearman rank correlation coefficient. Comparisons of knowledge and attitude scores between the professional groups were made using Kmskall-Wallis 1 way ANOVA tests.

4.3 Results

4.3.1 Response rate

A total of 289 usable questiormaires were retumed by general practitioners, 229 by practice nurses and 186 by health visitors. The response rates were 59.8%, 71.1% and 88.5% respectively.

4.3.2 Reliability testing

4.3.2.1 General practitioner survey

The correlation coefficient between the score for each individual attitudinal statement and the sum of the scores on the remaining statements are shown in Table 4.1 below.

Table 4.1 Correlation coefficients between the score for each attitudinal statement and the sum of the scores on the remaining statements for general practitioners.

Attitudinal statement	Item-total item correlation	Significance
Most accidents are preventable	0.34	p=0.001
I beUeve general practitioners can be effective in preventing chUdhood accidents	0.55	p=0.001
Accident prevention is not a priority for me in chUd health care	0.55	p=0.001
Other members of the PHCT have a greater responsibUity for accident prevention than the general practitioner	0.21	p=0.001
Accident prevention should be discussed in chUd health surveiUance consultations	0.55	p=0.001
Discussing accident prevention is important in a consultation for acute accidental injury	0.42	p=0.001
General practhioners should give first aid advice in consultations for acute accidental injury	0.39	p=0.001
Practices should routinely collect information on chUdhood accidents	0.54	p=0.001
General practitioners should be involved in lobbying or campaigning on local safety issues	0.56	p=0.001
It is important for practices to display posters and leaflets on accident prevention whenever possible	0.50	p=0.001
It is not appropriate for general practitioners to mention accident prevention on home visits	0.54	p=0.001
It is important for general practhioners to report concerns about child safety to other members of the PHCT	0.42	p=0.001

These resuhs indicate that the responses to each statement were significantly correlated with the responses to the other statements comprising the total score. The statements with the lowest correlations with the other statements in the overaU score were beUeving other members of the team had a greater responsibUity for accident prevention than the GP and beUeving that most accidents were preventable. Including all 12 statements, Cronbach's alpha coefficient, a measure of the intemal consistency of the attitudinal section of the questionnaire is 0.67.

4.3.2.2 Practice nurse survey

The correlation coefficient between the score for each individual attitudinal statement and the sum of the scores on the remaining statements are shown in Table 4.2 below.

Table 4.2 Correlation coefficients between the score for each attitudinal statement and the sum of the scores on the remaining statements for practice nurses.

Attitudinal statement	Item-total item correlation	Significance
Most accidents are preventable	0.26	p=0.001
I beUeve practice nurses can be effective in preventing childhood accidents	0.61	p=0.001
Accident prevention is not a priority for me in chUd health care	0.55	p=0.001
Other members of the PHCT have a greater responsibihty for accident prevention than the practice nurse	0.56	p=0.001
Accident prevention should be discussed in child health surveiUance consultations	0.34	p=0.001
Discussing accident prevention is important in a consuhation for acute accidental injury	0.35	p=0.001
Practice nurses should give first aid advice in consuhations for acute accidental injury	0.40	p=0.001
Practices should routinely coUect information on childhood accidents	0.53	p=0.001
Practice nurses should be involved in lobbying or campaigning on local safety issues	0.57	p=0.001
It is important for practices to display posters and leaflets on accident prevention whenever possible	0.44	p=0.001

These results indicate that the responses to each statement were significantly correlated with the responses to the other statements comprising the total score. The statements with the lowest correlations with the other statements in the overall score were believing most accidents were preventable, believing accident prevention should be discussed in child health surveillance and in consultations for acute injury. Including all 10 statements, Cronbach's alpha coefficient is 0.61.

4.3.2.3 Health visitors

The correlation coefficient between the score for each individual attitudinal statement and the sum of the scores on the remaining statements are shown in Table 4.3 below.

Table *43* Correlation coefficients between the score for each attitudinal statement and the sum **of the** scores **on the remaining statements for health visitors.**

Attitudinal statement	**Item-total item correlation**	**Significance**
Most accidents are preventable	0.21	p=0.01
I beUeve health visitors can be effective in preventing chUdhood accidents	0.32	p=0.001
Accident prevention is not a priority for me in child health care	0.41	p=0.001
Other members of the PHCT have a greater responsibUity for accident prevention than the general practitioner	0.34	p=0.001
Accident prevention should be discussed in chUd health surveiUance consultations	0.42	p=0.001
Notifications form the liaison health visitor at A&E are useful for building up a picture of the local accident problem	0.39	p=0.00]
It is not appropriate for health visitors to do home safety checks to identify hazards	0.39	p=0.001
It is important for health visitors to undertake post accident foUow up visits to discuss accident prevention	0.55	p=0.001
Health visitors should be involved in lobbying or campaigning on local safety issues	0.55	p=0.001
It is important for practices to display posters and leaflets on accident prevention whenever possible	0.43	p=0.001
Home visits provide a good opportunity to identify and discuss hazards in the home	0.45	p=0.001
Parents groups provide a good opportunity for the health visitor to teach first aid	0.50	p=0.001

The results in Table 4.3 indicate that the responses to each statement were significantly correlated wdth the responses to the other statements comprising the total score. The statements wdth the lowest correlations with the other statements in the overaU score were **believing** that most accidents were preventable and believing health visitors could be effective in preventing childhood accidents. Includmg all 12 statements, Cronbach's alpha coefficient is 0.54.

4. 3.3 Validity

The vaUdity of the knowledge section of the questiormaire has been assessed m a separate study (Marsh and Kendrick **1997)** by using the questionnaire to measure knowledge scores before and after primary health care team training sessions where aU the mformation required to correctly answer all questions on the knowledge section of the questiormaire was provided. A total of 58 primary health care team members who underwent chUdhood injury prevention training during 1994 completed a questioimaire pre and between 2 and 4 months post training. The distribution of knowledge scores before and after training are shown in Table 4.4 below. The maximum score obtainable on this section of the questionnaire was 23.

Table 4.4 Knowledge scores of 58 **primary health** care team **members** before **and after injury prevention training.**

	pre training score centiles			post training score centiles		
	25th	50th	75th	25th	50th	75th
General practitioners¶	10.5	12.0	13.0	12.0	13.5	19.0
Practice nurses¶¶	7.0	10.0	13.5	15.0	16.0	18.0
Health visitors†	12.0	13.5	15.5	14.5	16.0	18.0

WUcoxon matched pairs test ¶ p=0.003, ¶¶ p=0.006, † p=0.002

These resuhs suggest the knowledge section of the questionnaire was a valid instrument for measuring knowledge of childhood unintentional injury epidemiology.

4.3.4 Characteristics of responders and non-responders

4.3.4.1 General practitioners

Two thirds of the respondmg general practitioners were male (195, 67.5%). Sixty four (22%) were aged under 35 years, 118 aged between 35 and 44 years (41%), 68 aged between 45 and 54 (24%) and thirty seven aged 55 years and over (13%). Most respondents practised in small group practices with between 2 and 4 partners (166, 57%), less than a tenth practised in single handed practices (26, 9%) and one third practised in larger group practices wdth 5 or more partners (97, 34%). Almost one third of respondents practised more than 10 mUes from the nearest accident and emergency department (91, 32%), whilst 53% (154) practised from premises between 4 and 10 mUes and 15% (44) practised from premises up to three miles or less from the nearest accident and emergency department. Two thirds of the respondmg general practitioners had worked in hospital paediatrics for at least 6 months since quaUfying (181, 63%) and 10% (29) had worked m community paediatrics. Fifteen percent (44) hold a postgraduate quaUfication in paediatrics (DCH, DCCH or MRCP Paeds). Of the general practitioners who had children (243), one hundred and thirty one (54%) had experience of one of their chUdren attending an accident and emergency department foUowdng an mjury and 22 (9%) had experience of one of their children being admitted to hospital foUowdng an unintentional mjury. The characteristics of the general practitioners responding to this survey are similar to respondents to the national survey of general practitioners attitudes to chUd injury prevention undertaken by Carter and coUeagues (Carter et al 1995) and also to the characteristics of the popiUation of general practitioners currently practising m the United Kmgdom (Fry 1993).

No data were available on mdividual general practitioners not responding to the questionnaire. General practitioners from 138 of the total 175 practices in Nottinghamshire responded to the questionnaire. Practices where none of the general practitioners responded did not differ significantly from those where some or aU general practitioners responded m terms of number of partners (χ^2=4.56 2df p=0.10). Practices where none of the general practhioners responded did not differ by trammg status from those where some or all general practitioners responded (χ^2=2.15 with Yates correction I degree of freedom p=0.14) and were not more Ukely to be in a deprived area, based on the Nottingham County Council

Deprived Area Score, classified into areas of extreme disadvantage, serious disadvantage, moderate disadvantage and below average disadvantage (Nottinghamshire County Council 1985) (χ^2=0.01, 3 degrees of freedom p=0.99),

4.3.4.2 Practice nurses

Two thirds of the practice nurses were aged 44 years or less (155, 67.7%), wdth one quarter aged under 35 years (66, 28.8%). Two thirds had worked as a practice nurse for less than 5 years (159, 69.4%) and only 7% (16) had worked in practice nursing for 11 or more years. Very few practice nurses had prior occupational experience of nursing chUdren wdth only 4% (9) having worked as a school nurse for six months or more and 2% (4) being qualified as health visitors. Eighty seven percent had chUdren (198). The chUdren of 57% of the practice nurses who were parents (113) had attended accident and emergency departments foUowdng an injury, and the children of 14% of nurses (28) had been admitted to hospital foUowing an injury. The characteristics of practice nurses responding to the questiormaire were similar to those responding to previous surveys (Cant and KUloran 1993, Peter 1993, Bradford and Winn 1993, Greenfield et al 1987, Ross et al 1994).

4.3.4.3 Health visitors

Over half of the health visitors were aged 44 years or under (113, 60.7%) wdth one quarter being aged under 35 (46, 24.7%) and thiuteen percent (24) aged 55-64 years. Half of the health visitors had been practising for 11 years or more (93, 50%). A higher proportion of the health visitors had prior occupational experience of nursing chUdren than the practice nurses wdth 9% (14) being qualified chUdren's nurses but this difference was not statisticaUy signüficant (χ^2=1.90 with Yates correction, 1 degree of freedom p=0.17). Similarly a higher proportion of health visitors (30, 16%) had some experience of school nursing (χ^2=6.05, 1 degree of freedom p=0.014). Seventy three percent of health visitors were parents (135). The chUdren of over two thirds of the health visitors who were parents (93, 69%) had attended an accident and emergency department foUowdng an injury. This proportion was signüficantly higher than that for general practitioners or practice nurses (χ^2=8.28, 2 degrees of freedom, p=0.016). Thiuteen percent of the chUdren of health visitors had been admitted to hospital foUowing an mjury, but this proportion did not differ significantly from that of the children of general practitioners or practice nurses (χ^2=1.64, 2 degrees of freedom, p=0.44). The characteristics of health visitors respondmg to this survey were simUar to those respondmg to two previous surveys of the role of the health visitor in chUd injury prevention (Carter et al 1992, Maclnnes 1985).

4.3.5 Knowledge of childhood unintentional injury prevention epidemiology

The general practitioners, practice nurses and health visitors knowledge of childhood unintentional injury epidemiology is shown in Table 4.5.

Table 4.5 General practitioners', practice nurses' and health visitors' knowledge of childhood unintentional injury epidemiology (correct answers).

Question	No (%) answering correctly		
	GP's (n=289)	**PN's** (n=229)	HV's (n=186)
What is the most common cause of death?			
Under 1 year (SIDS)¶	56(19.4)	67(29.3)	32(19.9)
1-4 years (injury)¶¶	209(72.3)	150(65.5)	157(84.4)
5-16 years (injury)¶¶	206(71.3)	138(60.3)	149(80.1)
What is the trend in child injury death rates in the UK over the last 20 years? (Falling)	24(8.3)	16(17.0)	23(12.4)
What is the most common fatal injury in children?			
Under 1 year (suffocation)¶¶	49(17.0)	70(30.6)	52(28.0)
1-4 years (transport)¶	53(18.3)	24(10.5)	32(17.7)
5-16 years (transport)¶	142(49.1)	101(44.1)	105(56.5)
What proportion of children attend an A&E department annually following an injury? (1 in 6)¶¶	49(17.0)	46(20.1)	60(32.3)
What proportion of children attending A&E following injury are admitted to hospital? (5-10%)¶¶	102(35.3)	68(29.7)	96(51.6)
Which home accident causes most A&E attendances?			
Under 1 year (fall)¶¶	33(11.4)	23(10.0)	50(26.9)
1-4 years (fall)¶	51(17.6)	28(12.2)	44(23.7)
5-16 years (fall)	55(19.0)	42(18.3)	41(22.0)
Where do most fatal injuries occur?			
Under 1 year (home)	233(80.6)	183(79.9)	161(80.6)
1-4 years (on the road)¶¶	67(23.2)	147(64.2)	50(26.4)
5-16 years (on the road)	186(64.4)	130(56.8)	120(64.5)
Do girls have more injuries than boys? (fewer)¶¶	172(59.5)	91(39.7)	117(62.9)
Which of the following are risk factors for childhood injury?			
Teenage mother (yes)¶¶	255(88.2)	166(72.5)	144(77.4)
Single parent (yes)¶¶	248(85.8)	151(65.9)	130(69.9)
Previous injury (yes)¶¶	250(86.5)	149(65.1)	141(75.8)
>4 children in family (yes)¶¶	235(81.3)	154(67.2)	156(83.9)
socioeconomic deprivation(yes)¶¶	262(90.7)	188(82.1)	170(91.4)
family stress(yes)¶¶	245(84.8)	203(88.6)	180(96.8)

¶ χ^2 tests, 2 degrees of fieedom $p<0.05$ ¶¶ χ^2 tests, 2 degrees of fireedom $p<0.001$

The proportion of correct responses did not differ by occupational group in only 4 of the 22 questions. For six of the questions health visitors had a significantly greater proportion of correct answers than either general practitioners or practice nurses (most common cause of death aged 1-4 years, and age 5-16 years, the percentage of children attending A&E and the percentage admitted foUowing an injury, the home accident most commonly causing attendance at the A&E department to chUdren aged under I year and that stress in the family was a risk factor for chUdhood unintentional injury). For three questions a significantly greater proportion of general practitioners responded correctly than either practice nurses or health visitors (that matemal age under 20 at birth of first chUd, single parenthood and previous injury are all risk factors for unintentional injury). For two questions a significantly greater proportion of practice nurses responded correctly than either general practitioners or health visitors (the most common cause of death in chUdren aged under 1 year and the she of the most common fatal childhood accident in children aged 1-4 years).

The maximum score obtainable on this section of the questiormaire was 23. The distribution of scores by professional group is shown in Table 4.6.

Table 4.6 Distribution of scores of knowledge of childhood unintentional injury epidemiology by professional group.

Professional Group (n)	2Sth centile	50th centUe	75th centile
General practitioners (n=289)	11.0	13.0	15.0
Practice nurses (n=229)	10.0	12.0	14.0
Health visitors (n=186)	12.0	14.0	16.0

KmskaU-WaUis 1 way ANOVA, χ^2 =50.1, 2 df, p<0.001

The knowledge score for the health visitors was significantly higher than for either the practice nurses (Marm-Whitney U test Z=-6.7, p<0.001) or the general practitioners (Mann-Whitney U test Z=-3.2, p=0.001). The score for general practitioners was significantly higher than for practice nurses (Mann-Whitney U test Z=-4.7, p<0.001). Knowledge scores were significantly higher amongst female than male general practitioners (Mann-Whitney U test Z=- 2.1 p=0.04), amongst younger GPs (aged 44 years and under compared to 45 years and over, Marm-Whitney U test Z=-2.1, p=0.04), amongst general practhioners on the child health surveUlance Ust of the Family Health Services Authority (Mann-Whitney U test Z=-2.9 p=0.004), those with experience in hospital paediatrics (Mann-Whitney U test Z=-2.6 p=O.008) and those wdth a postgraduate quaUfication in paediatrics (Marm-Whitney U test Z=-2.1 p=0.03).

For practice nurses, those wdth chUdren and those wdth experience of school nursing had significantly higher knowledge scores (Marm-Whitney U tests Z=-2.6, p=0.04 and Z=-2.4 p=0.02 respectively). None of the other occupational or personal characteristics of the nurses were significantly associated with knowledge scores. The picture was different for health visitors with no significant difference in knowledge scores by any of the occupational or personal characteristics.

4.3.6 Attitudes towards childhood unintentional injury prevention

The general practitioners' and health visitors' questionnaires contained 12 attitudinal questions each and the practice nurses' questionnaire contained 10 questions. Seven questions conceming attitudes towards injury prevention were identical for aU professional groups. Two questions concemed only general practitioners and practice nurses. Three questions were asked only of general practitioners, one only of practice nurses and five only of health visitors. The results for the questions addressing aU professional groups are shown in Table 4.7 below.

attitudes towards injury prevention (%).

Attitudinal statement	Agree/ strongly agree	Neutral	Disagree/ strongly disagree	Significance
Most injuries are preventable				
General practitioners	227(78.5)	58(20.1)	2(0.7)	χ^2=17.0
Practice nurses	203(887)	20(10.9)	0(0)	2 df pO.OOl
Health visitors	164(88.2)	20(10.8)	0(0)	
I believe GP/PN/HV can be effective in preventing childhood injuries				
General practitioners	74(25.6)	143(49.5)	69(23.9)	χ^2=200.0
Practice nurses	106(46.3)	100(43.7)	21(9.2)	4df
Health visitors	167(89.8)	17(9.1)	1(0.5)	pO.OOl
Injury prevention is not a priority for me in child health care				
General practitioners	51(17.6)	111(38.4)	124(42.9)	χ^2=89.1
Practice nurses	34(14.8)	62(27.1)	132(57.7)	4 df pO.OOl
Health visitors	16(8.6)	10(5.4)	159(85.5)	
Other members of the PHCT have a greater responsibility for injury prevention than the GP/PN/HV				
General practitioners	183(63.3)	72(24.9)	30(10.4)	χ^2=276.0
Practice nurses	95(41.5)	62(27.1)	69(30.1)	4 df pO.OOl
Health visitors	8(4.3)	23(12.4)	154(82.8)	
Injury prevention should be discussed in CHS consultations				
General practitioners	169(58.5)	95(32.9)	21(7.3)	χ^2=98.2
Practice nurses	183(80.0)	31(13.5)	11(4.8)	4df
Health visitors	180(96.7)	3(1.6)	1(0.5)	pO.OOl
GP/PN/HV should be involved in lobbying or campaigning on local safety issues				
General practitioners	76(26.3)	118(40.8)	93(32.2)	χ^2=158.4
Practice nurses	62(27.1)	119(52.0)	47(20.5)	4 df pO.OOl
Health visitors	139(74.7)	46(24.7)	0(0)	
It is important for practices to display leaflets on injury prevention wherever possible				
General practitioners	206(71.3)	59(20.4)	22(7.6)	χ^2=48.1
Practice nurses	205(89.5)	19(8.3)	4(1.7)	4 df pO.OOl
Health visitors	170(91.4)	15(8.1)	0(0)	

Exploring the differences between the professional groups using χ^2 tests, wdth Yates correction where appropriate, revealed that a significantly greater proportion of health visitors than practice nurses responded positively to the statements regarding beUef in their effectiveness in preventing chUdhood injuries (χ^2=87.3, 2 df, $p<0.001$), injury prevention being a priority in chUd health care (χ^2=42.5, 2 df, $p<0.001$), beUeving other members of the team did not have a greater responsibUity for injury prevention (χ^2=120.9, 2 df, $p<0.001$) and discussing injury prevention in chUd health surveUlance consuhations (χ^2=27.6, 2 df, $p<0.001$). Comparing the responses to the same attitudinal statements between practice nurses and GPs revealed that practice nurses responded more positively tiian the GPs on each of the four statements (x^2=32.5, 2 df $p<0.001$, χ^2=11.1, 2 df, $p=0.004$; χ^2=37.7, 2 df, $p<0.001$; χ^2=29.5, 2 df, $p<0.001$ respectively).

General practitioners were sigrúficantly less Ukely to beUeve most injuries are preventable than either practice nurses (χ^2=13.5, 1 df, $p<0.001$) or health visitors (χ^2=8.01, 1 df $p=0.005$), but there was no difference between the proportion of practice nurses and health visitors beUeving most injuries are preventable (χ^2=0.41, 1 df, $p=0.50$). Health visitors were sigrúficantly more Ukely to beUeve that they should be involved in lobbying or campaigning than either GPs (χ^2=127.0, 2 df, $p<0.001$) or practice nurses (χ^2=105.5, 2 df, $p<0.001$), and both health visitors (χ^2=31.0, 2 df, $p<0.001$) and practice nurses^2(χ =26.6, 2 df, $p<0.001$) thought it was more important to display leaflets on injury prevention than Gps.

Of the total of seven questions appUcable to each professional group, the highest proportion of positive responses were given by health visitors for six of the questions, with health visitors and practice nurses beìng equally positive about one question. General practitioners were consistent in giving the lowest proportion of positive responses across aU seven questions. This partem of general practitioners giving a lower proportion of positive responses was no longer evident for the two questions concerning consultations for acute injury as shown in Table 4.8.

Table 4.8 General practitioners' and practice nurses' attitudes towards giving injury prevention and first aid advice during consultations for acute injury (percentage)

Attitudinal Statement	Agree/ strongly agree	Neutral	Disagree/ strongly disagree	Significance
Discussing accident prevention b important in a consultation for acute injury				
General practitioners	251 (86.9)	23(8.0)	13(4.5)	χ^2=2.65
Practice nurses	188(82.1)	24(10.5)	16(7.0)	2 df, p=0.27
GPs/PNs should give first aid advice in consultations for acute injury				
General practitioners	223(77.2)	43(14.9)	19(6.6)	χ^2=2.08
Practice nurses	166(72.5)	45(19.7)	15(6.5)	2 df, p=0.35

The remaining questions conceming only one professional group are shown in Table 4.9 below.

Table 4.9 Attitudes towards a variety of childhood injury prevention activities by professional group (percentage)

Attitudinal statement	Agree or strongly agree	Neutral	Disagree or strongly disagree
General Practitioners			
It is not appropriate for GPs to mention accident prevention during home visits	38(13.1)	52(18.0)	196(67.8)
Practices should routinely collect information on childhood accidents	79(27.3)	90(33.2)	112(38.8)
It is important for GP's to report concerns about child safety in individual families to other members of the PHCT	259(89.6)	251(8.7)	3(1.0)
Practice nurses			
Practice nurses should routinely collect information on childhood accidents	104(45.5)	96(41.9)	28(12.2)
Health visitors			
Home visits provide a good opportunity to identify and discuss hazards in the home	180(96.7)	5(2.7)	0(0)
It is not appropriate for HV's to do home safety checks to identify hazards in the home	49(26.3)	62(33.3)	71(38.1)
Notifications from the Liaison HV at A&E are useful for building a picture of the local accident problem	164(88.2)	16(8.6)	4(2.1)
It is important for HV's to undertake post accident follow-up visits to discuss accident prevention	132(71.0)	50(26.9)	2(1.1)
Parents groups such as Mother & Toddler groups provide a good opportunity for the HV to teach first aid	144(77.4)	30(16.1)	8(4.3)

This demonstrates that the majority of general practitioners beUeved it was appropriate for them to mention accident prevention on home visits and that they should report concerns about child safety in individual famiUes to other members of the primary health care team. Fewer agreed that practices should routinely collect information on chUdhood accidents.

The responses received from practice nurses regarding coUecting mformation on chUdhood accidents were similar to those from the general practitioners. A large proportion of health visitors agreed that home visits provided a good opportunity to identify and discuss hazards, but many fewer beUeved beUeved h was appropriate for health visitors to do home safety checks to identify hazards in the home. A large proportion feh notifications from the Uaison health visitor at the accident and emergency department were useful for describmg the local epidemiology of chUdhood mjuries and a similar proportion feh post accident follow-up visits were important. The majority of health visitors felt parents groups provided a good opportunity for teaching first aid.

An overaU 'attitude' score was created by summing the scores for each individual statement and dividing by the number of questions responded to m the attitude section of the questionnaire (12 for GP's and health visitors and 10 for practice nurses). Missing responses were scored zero, and excluded from the denominator. One practice nurse, one health visitor and two GP's did not answer any of the questions m the attitude section of the questionnaire, and are coded as scoring zero. The distribution of attitude scores by professional group shown in Table

4.10 below.

Table 4.10 Distribution of scores **of attitude towards childhood** injury **prevention for** general **practitioners,** practice nurses and **health** visitors.

	Attitude scores		
Professional Group	25th centile	50th centile	75th centile
General practitioners	3.17	3.50	3.83
Practice nurses	3.40	3.80	4.20
Health visitors	4.00	4.25	4.58

KmskaU-WaUis 1 way ANOVA, χ^2=209, 2 df, p<0.001

Mann-Whitney U tests were used to explore the differences between the professional groups. Health visitors had a higher score than either practice nurses (Z=-9.3, p<0.001) or GPs (Z=-14.1, p<0.001). Practice nurses had a higher score than GP's (Z=-5.8, p<0.001).

For each professional group, comparisons of attitude score by personal and occupation details have also been made. For general practitioners the attitude score was significantly higher amongst female than male practitioners (Marm Whitney U test Z=-2.39 p=0.02) and amongst those on the child health surveillance list as compared to those not on the list (Marm Whitney U test Z=-2.78 p=0.005). The attitude score was not significantly associated with any of the other personal or occupational details of general practitioners. None of the personal or occupational characteristics of either practice nurses or health visitors were significantly associated with the attitude score. For general practitioners and health visitors there was a significant (but weak) correlation between attitude and knowledge scores with a more positive attitude being correlated with a higher knowledge score (Spearman correlation coefficient $r=0.15$ $p=0.009$ and $r=0.27$ $p<0.001$ respectively). No association between knowledge and attitude scores was however found for practice nurses ($r=0.11$, $p=0.08$). The scatter plots of knowledge and attitude scores for each professional group are shown in Appendix F.

4.3.7 Current practice in injury prevention

The questions conceming current practice in injury prevention were based on those activities suggested in the Health of the Nation and those that have been discussed in the literature as part of the role of each occupational group. Seven of the questions were identical across all professional groups. The responses to these questions are shown in Table 4.11 below.

Table 4.11 General practitioners', practice nurses' and health visitors' self reported practice in childhood unintentional injury prevention

Current practice	Always/ often	Sometimes	Rarely never	Significance
How often, if ever do you given advice about safety equipment in CHS contacts?				
General practitioners	31(10.7)	89(30.8)	106(36.7)	χ^2=200.3
Practice nurses	28(12.2)	84(36.7)	93(40.6)	4 df,
Health visitors	124(66.7)	44(23.7)	10(5.4)	pO.OOl
How often, if ever, when discussing safety equipment do you give details of local stockists or equipment loan schemes?				
General practitioners	7(2.4)	28(9.7)	250(86.5)	χ^2=310.3
Practice nurses	13(5.6)	40(17.5)	147(64.2)	4 df,
Health visitors	92(49.4)	67(36.0)	25(13.4)	pO.OOl
If you give advice about safety to parents, how often, if ever do you also give parents a safety leaflet?				
General practitioners	13(4.5)	25(8.7)	246(85.1)	χ^2= 288.1
Practice nurses	16(11.4)	41(17.9)	143(62.4)	4 df,
Health visitors	80(43.0)	84(45.2)	22(11.8)	pO.OOl
	Yes	**No**	**Don't know**	**Significance**
The practice/HV has analysed data on childhood accidents in the last 2 years				
General practitioners	17(5.9)	250(86.5)	22(7.6)	χ^2=258.6
Practice nurses	10(4.4)	129(56.3)	85(37.1)	4 df,
Health visitors	81(43.5)	94(50.5)	5(2.7)	pO.OOl
I have attended a course or lecture on child accident prevention in the last 2 years ¶				
General practitioners	45(15.6)	238(82.4)	5(1.7)	χ^2=46.0
Practice nurses	15(6.6)	214(93.4)	0(0)	2 df,
Health visitors	58(31.2)	125(67.2)	1(0.5)	pO.OOl
I have worked with a local child safety group in the last 2 years ¶				
General practitioners	8(2.8)	277(95.8)	4(2.1)	χ^2=39.2
Practice nurses	3(1.3)	224(97.8)	2(0.9)	2 df,
Health visitors	25(13.4)	152(81.7)	0(0)	pO.OOl
I have lobbied or campaigned on local safety issues in the last 2 years ¶				
General practitioners	8(2.8)	275(95.2)	6(2.1)	χ^2=55.8
Practice nurses	4(1.7)	224(97.8)	1(0.4)	2 df,
Health visitors	33(17.7)	150(80.6)	0(0)	PO.OOl

¶ Don't know responses excluded from the analyses.

A greater proportion of health vishors reported undertaking aU seven activities that either general practitioners (χ^2 tests, with Yates correction, where appropriate, aU p values <0.00I) or practice **nurses** (χ^2 tests, with Yates correction where appropriate, aU p values <0.001). More practice nurses than general practitioners gave detaUs of stockists of safety equipment or local loan schemes ($\chi^2=16.2$, 2 df, $p<0.001$) and safety leaflets ($\chi^2=17.4$, 2 df, $p<0.001$) . More general practitioners than practice nurses had attended a course or lecture on chUd accident prevention in the preceding two years ($\chi^2=10.2$, 2 df, $p=0.001$).

General practitioners and practice nurses were asked identical questions conceming **giving** injury prevention and first aid advice in consultations for acute injury and displaying posters or leaflets with a simUar proportion of both groups giving first aid and or injury prevention advice and displaying injury prevention Uterature as shown in Table 4.12.

Table 4.12 General practitioners' and practice nurses' self reported current practice in childhood unintentional injury prevention

Current practice	Always or often	Sometimes	Rarely or never	Significance
How often, if ever, do you give advice about first aid in a consultation for acute injury?				
General practitioner	138(47.8)	101(34.9)	46(15.9)	χ^2=0.4
Practice nurse	103(45.0)	82(35.8)	32(14.0)	2 df, p=0.83
How often, if ever, do you discuss how future accidents can be prevented when you see a child foOowing an acute accidental injury?				
General practitioners	136(47.1)	116(40.1)	36(12.5)	χ^2=12.0
Practice nurses	117(51.1)	56(24.5)	41(17.9)	2 df, p=0.002
	Yes	**No**	**Don't know**	**Significance**
Posters on child safety have been displayed in the waiting room in the last 2 years				
General practitioners	177(61.2)	56(19.4)	55(19.0)	χ^2=6.8
Practice nurses	159(69.4)	44(19.2)	25(10.9)	2 df, p=0.04

General practitioners and health visitors were both asked how often, if ever, they identified hazards in the home on home visits and discussed them wdth patients. Forty one percent of general practitioners compared to none of the health visitors reported they rarely or never undertook this activity (χ^2=225.6 2 degrees of freedom p<0.001). OrUy 15% of general practitioners (44) reported they rarely or never reported concerns about mdividual chUdren at risk of accidental injury to other members of the primary health care team. One hundred and thirteen health visitors reported that they ran parents' groups. These health visitors were more Ukely to nm sessions on preventing injuries than on first aid. Seventy sbc percent (86) reported they always or often ran a group session on preventing accidents, and 29% (33) always or often ran a session on first aid (χ^2=51.7, 2 degrees of freedom, $p<0.001$). Forty eight percent of heahh vishors (89) reported they always or often undertook post accident follow up visits on receipt of notification of a chUd attendimg the A&E department foUowing an unimtentional injury.

FimaUy aU professional groups were asked if they had had contact im the preceding two years with a range of occupations and agencies about chUd safety in general or about a specific chUd. The results are shown in Table 4.13 below which Ulustrates that health visitors were more Ukely to have contact wdth occupational groups and agencies (both within and without the PHCT) than general practitioners or practice nurses.

Table 4.13 Frequency of self reported contact with a range of occupations and agencies with a role in child injury prevention (%).

Occupational group/agency	Number of professionals having contact with occupational group or agency		
	General practitioners	Practce nurses	**Health visitors**
Housing department¶	61(21.1)	5(2.2)	149(80.1)
Environmental health¶	32(11.1)	8(3.5)	108(58.1)
Road safety officer¶	9(3.1)	8(3.5)	44(23.7)
Fire and rescue service¶	5(1.7)	5(2.2)	21(11.3)
Ambulance service	18(6.2)	12(5.2)	5(2.7)
Police¶¶	28(9.7)	18(7.9)	33(17.7)
Community paediatrician¶	51(17.6)	22(9.6)	86(46.2)
Health visitor¶¶	231(79.9)	155(67.7)	135(72.6)
General practitioner¶	119(41.2)	144(62.9)	130(69.9)
Local school¶	38(13.1)	36(15.7)	104(55.9)
Public health physician¶¶	16(5.5)	4(1.7)	18(9.7)
Community development worker¶	7(2.4)	4(1.7)	24(12.9)
FHSA health promotion advisor	19(6.6)	6(2.6)	13(7.0)
Health promotion officer¶	4(1.4)	3(1.3)	42(22.6)
Child safety group¶	7(2.4)	4(1.7)	31(16.7)
Voluntary organisation¶	14(4.8)	6(2.6)	60(32.3)

χ^2 tests, 2 df, ¶ $p<0.001$; ¶¶ $p<0.05$

The number of contacts was normally distributed for health visitors (25th centile 4.0, median 5.0, 75th centUe 8.0), but was skewed to the left for both general practitioners (25th centUe 1.0, median 2.0, 75th centUe 3.0) and practice nurses (25th centUe 0, median 2.0, 75th centile 2.0). The number of contacts differed significantly by professional group (KmskaU-WaUis I way ANOVA, χ^2 =194.3, 2 df, $p<0.001$). Health visitors had a higher number of contacts than both general practitioners or practice nurses (**Mann-Whitney** U tests Z=-12.0, $p<0.001$ and Z=-12.6, $p<0.001$ respectively). There was no sigrúficant difference in the number of contacts with other occupational groups or agencies between general practitioners and practice nurses (**Mann-Whitney** U test, Z=-I.7, p=0.09).

Comparisons were made between the proportion of each professional group reporting each injury prevention activity and personal and occupational characteristics. There were no significant differences in the proportion of practice nurses or health visitors reportmg mjury prevention activity by any of the personal or occupational characteristics. For general practhioners, doctors practising in smaU practices (4 or fewer partners) more often gave safety leaflets when giving safety advice to parents than doctors in larger practices (χ^2 = 6.6, 2 degrees of freedom p=0.04).

For aU professional groups and aU activities, a greater proportion of respondents agreed or strongly agreed that an activity should be undertaken, than actually undertook that activity as shown in Table 4.14 below.

Table 4.14 Percentage of each professional group who agreed an injury prevention activity should be uundertakenwho regularly undertook, or had undertaken, such activity in the preceding 2 years.

Activity	Percentage undertaking activity in preceding 2 years		
	General practitioners	**Practice nurses**	**Health visitors**
Lobbying or campaigning	9%(7/70)	5%(3/62)	**22%(31/139)**
Collecting injury **information**	**14%(11/79)**	7%(7/104)	n/a
E>isplaying posters and leaflets	68%(141/206)	73%(149/205)	n/a

Activity	Percentage undertaking activity always or often in the preceding 2 years		
	General practitioners	**Practice** nurses	**Health visitors**
Identifying hazards on home visits and discussing with parents	14%(28/196)	n/a	**81%(145/180)**
Discussing safety equipment in CHS consultations	16%(27/169)	**14%(25/183)**	**68%(122/180)**
Discussing first aid in acute **injury** consultations	57%(128/233)	54%(90/166)	n/a
Discussing injury prevention in acute injury consultations	**51%(127/251)**	**54%(102/188)**	n/a
Reporting concerns re safety of children to other members of PHCT	**60%(**156/259)	n/a	n/a
Undertaking post injury follow up visits	n/a	n/a	61%(81/132)
Teaching first aid to parents groups	n/a	n/a	**22%(31/144)**

4.3.8 Summary of Results

1 The survey response rates ranged from 59.3% amongst general practitioners 71.7% amongst practice nurses to 88.5% amongst heahh visitors.

2 The correlation coefficients for the score for individual attitudinal statements and the total score (nunus the individual statement score) ranged from 0.21 to 0.61. The range of correlation coefficients was similar for general practitioners, practice nurses and health visitors. AU correlation coefficients, except one, were signficant at the $p=0.001$ level.

3 Cronbach's alpha coefficient for the attitudmal section of the questiormaire was 0.67 for general practitioners, 0.61 for practice nurses and 0.54 for health visitors.

4 Use of the questionnaire in a group of primary health care team members pre and post mjury prevention training indicated signficant changes in knowledge scores post training, suggesting the tool was a vaUd instmment for measuring knowledge of injury epidemiology.

5 Comparing the characteristics of the practices where none of the general practitioners responded to the questionnaire with those of practices where some or all of the general practitioners responded indicated non

responding practices did not differ significantly in terms of practice size, training status or being in a deprived area.

6 The knowledge score was significantly higher for health visitors than for either general practitioners or practice nurses. The score for general practitioners was sigrủficantly higher than for practice nurses.

7 The knowledge questions least Ukely to be answered correctly included the ttend ̇m chUd accident death rates over the last 20 years, the most common cause of death in children aged over one year, the most common injury requiring A&E attendance under 1 year of age and aged 1-4 years, the most common fatal injury in children aged under 1 year and aged 1-4 years.

8 The knowledge questions most lUcely to be answered correctly ̇mcluded the location of fatal chUdhood ̇mjuries under 1 year of age, risk factors per chUdhood ̇mjury and the most common cause of death in children aged 1-4 years and 5-16 years.

9 Knowledge scores were **significantly** higher among female general practitioners, younger general practitioners, those on the child health surveillance list, those wdth experience in hospital paediatrics and with a postgraduate quaUfication in paediatrics. Practice nurses with children and those with experience of school nursing had sigrủficantly higher

knowledge scores. None of the personal or occupational characteristics of health visitors were significantly associated with knowledge scores.

10 There were significant correlations between knowledge and attitude scores for general practitioners and health vishors, but not for practice nurses.

11 Health visitors had a significantly higher attitude score than either general practitioners and practice nurses. Practice nurses had a significantly higher score than general practitioners.

12 A higher proportion of health vishors responded positively on the attitudinal statements than general practhioners on all 7 questions which were identical for all professional groups. For six of the seven questions a greater proportion of practice nurses also responded more positively than the general practitioners. For five of the questions a greater proportion of health vishors responded more posUively than practice nurses.

13 General practitioners were least likely to believe they could be effective in preventing childhood unintentional injuries, that injury prevention was a priority for them in child health care, that injury prevention should be discussed in child health surveillance consuhations, that they should be involved in lobbying or that practices should routinely collect injury data.

They were most likely to beUeve that most accidents were preventable, to agree that injury prevention first aid should be discussed in consultations for acute injury, that practices should display posters and leaflets about injury prevention and that they should report concems about child safety to other members of the primary health care team.

14 Practice nurses were least likely to believe they should be involved in lobbying or campaigning, foUowed by believing that other members of the primary health care team had a greater responsibility for injury prevention, routinely coUecting data and beUevdng they could be effective in preventing chUdhood injuries. They were most likely to believe that practices should display posters and leaflets, that most accidents are preventable, that injury prevention should be discussed in child heahh surveillance consultations and that injury prevention and first aid should be discussed in consultations following acute injury.

15 Health visitors were least likely to agree that it was appropriate for health visitors to do home safety checks to identify home hazards. They were most likely to agree that injury prevention should be discussed in childhood surveiUance consultations, that home visits provide a good opportunity to identify and discuss home hazards, that most accidents are preventable and that health visitors can be effective in preventing injuries; that practices should display posters and leaflets and that notifications from the A&E Uaison health visitor were usefiil for building up a picture

of the local accident problems. A significantiy greater proportion of health vishors believed that they should be involved in lobbying or campaigning than practice nurses or general practitioners.

16 The attitude score was significantly higher amongst female general practitioners and those on the chUd health surveiUance Ust. There were no significant associations between attitude score and any of the personal or occupational characteristics of health visitors or practice nurses.

17 A higher proportion of health visitors reported more frequent injury prevention activity than either general practhioners or practice nurses for all seven questions which were included for all professional groups. General practhioners were more likely than practice nurses to have attended a course or lecture on childhood injury prevention in the preceding 2 years and to give injury prevention advice during consultations for acute injury, but **less** likely than practice nurses to give detaUs of local stockists or local schemes for safety equipment or leaflets on safety. Health visitors were significantly more likely to identify hazards in the home than general practitioners.

18 Health visitors had a significantly higher number of contacts with other agencies and professionals about chUd safety than practice nurses or general practitioners, but there was no difference in the number of contacts between general practitioners and practice nurses. The highest

proportion of general practitioners and practice nurses reported contact with other members of the practice team, whereas the highest proportion of health vishors reported contacts with the Local Authority housing department.

19 For all professional groups, and for all activities, a greater proportion of respondents agreed or strongly agreed that an activity should be undertaken than actuaUy undertook that activity. Lobbying or campaignimg and coUectimg imjury data were the activities with the smaUest proportion of proponents for an activity actuaUy undertaking that activity.

4.4 Discussion

4.4.1 Reliability and validity of the questionnaire

A test and retest procedure to assess reproducibUity was not undertaken as it was considered Ukely that undertaking the questionnaire would act as an awareness raising exercise so influencing the responses on the second questionnaire and thus making it difficuh to assess reproducibiUty. The relationship between individual items of the attitudinal section of the questionnaire and the overall attitudinal score has been described in several ways. Firstly the correlation between the score on each individual statement and the overall score minus the score for that particular statement has been calculated. These correlation coefiicients ranged from 0.21 to 0.61 with a simUar range for each occupational group. For all statements, except one, for aU professional groups the correlation coefficients were statisticaUy significant at the $p<0.001$ level. This suggests that the majority of attitudinal statements were highly correlated with the other attitudinal statements comprising the total score (Streiner and Norman 1995).

These descriptive statistics however, do not assess the degree of consistency between response to one attitude statement and responses to a second attitudinal statement. This was assessed by calculating Cronbach's alpha coefficient, which is a measure of the average correlation of the score for each attitudinal statement with aU the other attitudinal statements used to calculate the overaU score. It is assumed that each of the individual statements should be positively correlated wdth each other as they are measuring a common entity. The alpha coefficient can be interpreted either as the correlation between this measure of attitude towards injury prevention and aU other possible tests of attitude towards injury prevention, or as the correlation between the score obtained on this **attitudinal questionnaire** and the score the same person would obtain if questioned on aU the possible questions on attitude towards injury prevention. The alpha coefficient can range from 0 to 1, i.e. from no correlation to a perfect correlation. The coefficients of 0.67 for **general** practitioners, 0.61 for practice nurses and 0.54 for health visitors suggest that the responses within each professional group are relatively consistent (Streiner and Norman 1995).

It is important not only for the measurements undertaken with the questionnaù-e to be reUable, but also to be vaUd, in that they must measure what they purport to measure. The content validity of the questiormaire which is the extent to which the questionnaire incorporates all the relevant areas of childhood urùntentional injury epidemiology, the attitudes towards and **current** practices in injury prevention, was established by expert advice, advice from primary health care team members and inclusion of aU activities described as being part of the roles of the various team members in the pubUshed Uterature. Constmct validity is the extent to which the measurements made using the questioimaire correspond to theoretical constmcts (hypotheses) conceming chUdhood unintentional injury prevention. The measurement of knowledge of childhood unintentional injury epidemiology did appear to have constmct vaUdity with higher scores obtained in general practitioners wdth postgraduate qualifications in paediatrics and in those with experience in hosphal paediatrics, who might be expected to have a greater knowledge about chUdhood uruntentional injuries. FinaUy predictive vaUdity was assessed by using the same questiormaire to assess knowledge foUowing primary health care team trainimg where the information required to correctly respond to aU the knowledge questions was provided. This Ulustrated a significant increase in knowledge scores in aU professional groups (Marsh and Kendrick 1997), suggesting the questionnaire was a valid instmment for measuring such knowledge.

The vaUdity of the attitudmal questions and the current practice questions has not assessed in this study, or in any of the pubUshed studies conceming the role of primary health care team members in injury prevention (Laidman 1987, Levene 1992, Ehiri and Watt 1995, Carter et al 1992, Carter and Jones 1993a, Leveque et al 1995, Morgan and Carter 1996b). The validity of self reported preventive practice amongst primary health care team members has been studied, but little work has been done in this area, in injury prevention. Lewis studied disease prevention and health promotion activities of primary care physicians in the United States and compared self reported practice wdth practice recorded in medical records. Self reported practice was consistently found to overestimate recorded practice (Lewis 1988). This may reflect either over reporting or under recording of practice. As payment for many of the services in this study by Lewis depended on recordimg that they had occurred, over reporting seems a more plausible explanation for the difference than under recording. One study has compared physician's self reports of anticipatory injury prevention in weU child care with parental reports and found physicians report giving more advice than parents report receiving (Morrongiello et al 1995). This may reflect physician over-reporting, parental under-reporting or both. Similar studies of validations of self reported injury prevention activity could not be found for health vishors or practice nurses, but it seems Ukely that the phenomenon of over reporting would also apply to these professional groups. Bearing this in mind, caution must be exercised in interpreting the responses to these current practice questions, and these should probably be viewed as over estimates of the tme level of current practice.

4.4.2 Response Bias

The comparisons of practice detaUs between responders and non responders to the questionnaire suggest that there are no systematic differences in terms of practice size, ttaining status and practising in a deprived area between responders and non responders. Although the response rates were high for health visitors and practice nurses, and sunUar to, or higher than, response rates in other postal questionnaires in these groups (Carter et al 1992, Morgan and Carter 1996a, **Greenfield** et al 1987, Cant and KiUoran 1993, Bradford and Winn 1993, Ross et al 1994), it is Ukely that responders represent those most interested in the subject of chUdhood injury prevention, whilst those least interested were probably less Ukely to respond. This phenomenon has been noted in previous research using postal questionnaire surveys **(Cartwright** 1983). Caution must therefore be exercised in extrapolating the results of these surveys to the population of general practitioners, practice nurses and health visitors and it may be reasonable to assume that aU non responders would have responded negatively to prevent over estimation of knowledge, attitudes and current practice amongst primary health care team members in Nottinghamshire.

4.4.3 Measurement Bias

It could be argued that the questions on current practice cover what might be considered to be "good practice" in injury prevention, making it less Ukely that respondents would answer in a negative fashion. The questions were worded to include the possibUity of never undertaking a particular activity e.g. "How often, if ever, do you give advice about safety equipment in chUd health surveUlance consultations?". Also, some of the activities in the current practice questions were not routinely avaUable to primary health care team members at the time of the survey. For example, leaflets about child safety were not routinely available to practices from the resources unit of the local Community Health Tmsts and could only be obtained by purchase. This meant that whUst supplying parents wdth safety leaflets might be considered routine good practice, general practitioners and practice nurses did not have access to such Uterature without extra cost. Similarly although some locality based low cost safety equipment schemes were operating in Nottinghamshire, they did not cover all geographical areas and only health visitors could refer parents to them and had written details on such schemes. Consequentiy whUst some activities may seem to be self-evidently good practice, the lack of resources to undertake some of these activities should have precluded some respondents from responding positively to such questions. The low proportion of positive responses to most questions conceming current practice amongst general practitioners and practice nurses indicates that respondents were not only respondmg positively. The decision to regard self reported practice as an overestiinate of actual activity will also tend to negate the effect of respondents responding positively towards perceived good practice.

4.4.4 Knowledge of childhood unintentional injury epidemiology

As yet there are no published studies concenüng primary health care team members knowledge of chUdhood unintentional injury epidemiology with which to compare these results. This is surprising as lack of knowledge or information has previously been cited as one of the barriers to injury prevention (Laidman 1987, Carter et al 1992, Carter and Jones 1993a, Carter et al 1995). One pubUshed study using a telephone survey in France during 1993 and 1994 studied a representative sample of private practice paediatricians, weU-chUd clinic paediatricians and general practitioners and did include questions conceming the epidemiology of fetal injuries, but these questions were asked only of the first two groups of practitioners and not of general practitioners (Leveque et al 1995). Consequently comparison wdth these resuhs is not possible.

OveraU the questionnaire has demonstrated that all three professional groups have some considerable knowledge of childhood uriintentional injury epidemiology. There are obvious gaps in knowledge and these are similar across the professional groups wdth the lowest proportion of correct responses questions concenuing causes of mortaUty, mjury **mortality** and morbidity amongst chUdren under the age of one year. The ordy questions concenuing this age group in which a high proportion of respondents answered conectly was the location of most fatal injuries. The lack of knowledge concenuing mjuries in this age group is interesting. It may reflect the primary health care teams lack of experience of deaUng wdth mjured chUdren in this age group as the number injured each year is relatively smaU when compared to older children (Office for National Statistics **1996,** Department of Trade and Industry **1996)** Also the **'Back** to Sleep' campaign which aUned to reduce the **incidence** of Sudden Infent Death Syndrome was taking place around the time of this questionnaire and respondents may have thought the success of the campaign had sufficiently reduced the incidence of SIDS for it to no longer be the most common cause of mortality in the under 1 year olds. Alternatively, but probably less Ukely, respondents, may not have been aware that prior to the **'Back** to Sleep' campaign SIDS was the most common cause of infant mortality. Congenital abnormaUties were cited as the most common cause of death in chUdren **under** 1 year of age by 47% of general practitioners and by 32% of health visitors. The erroneous perception that congenital abnormalities are the most common cause of death may be due to the emphasis placed on screening for **congenital** abnormaUties in ante-natal care and in routine child health surveiUance (Hall).

Burns and scalds were the mjuries most commonly stated as resulting in A&E attendance in the under **1's** by health visitors (44%) and practice nurses (37%).

Most general practitioners reported that they did not know the most common injury requiring A&E attendance **(39%)** with bums and scalds being the second most frequent response **(31%)**. This suggests that bums and scalds are perceived as occurring more frequently than they do m reality. This is interesting, especiaUy as the paediatric Uaison health visitors working in the local accident and emergency departments notify all injuries occurring to chUdren aged under I year presenting to the accident and emergency department *to* cormnunity health visitors, who should therefore, in theory, be aware of the incidence of different injury types amongst A&E attenders in this age group. This may reflect differential recaU of more serious injuries rather than more minor injuries. Bearing in mind the lack of **knowledge** conceming mjury morbidity and mortaUty in infants it is unlikely that the information concening prevention being given to parents accurately reflects the risk of injury to their children. Interestingly one study of parents' perceptions of risks of injury in children under 5 years of age (Glik et al 1991) suggested that parents perceptions of the risk of **their** child suffering a variety of unintentional injuries accurately reflect the epidemiology of unintentional injuries attending both primary health care teams and accident and emergency departments (Department of Trade and Industry 1996, Royal College of General Practitioners 1995, Agass et al 1990, Marsh et al 1995, Steele et al 1994). This contrasts with the less **accurate** perceptions of members of the primary health care teams found in this study.

Primary health care team members had a greater knowledge of the most common cause of death in chUdren aged over one year, the most common cause of injury mortality in children aged over 5 years and the location of most fatal injuries in children aged over 5 years. This may be because the mortaUty form road traffic accidents is far greater than for any other cause of death or for any other type of injury in this age group (Office for National Statistics 1996). Responses may also have been influenced by recent Government mass media campaigns such as "Killing speed and saving Uves"(Department of Transport 1992). The knowledge of risk factors for chUdhood injury was also good amongst aU professional groups, which may reflect the simUarity in risk factors for other adverse child health outcomes such as sudden infant death, non accidental injury, low uptake of immunisation or other preventive chUd health services (HaU 1996, Browne and Saqi 1988, Zinkin and Cox 1976, Marsh and Channing 1986, Jarman et al 1988, Reading et al 1994, MitcheU et al 1992).

It was not surprising that health visitors had a higher knowledge score than either general practitioners or practice nurses. Previous studies have found that injury prevention training is provided as part of the pre-registration and in-service training for health visitors (Laidman 1987, Morgan and Carter 1996a). In one recent survey a majority of health visitors had received in-service training in this area (Morgan and Carter 1996a). These studies however also suggest that the training is often perceived as being inadequate to meet the needs of individual health visitors and students. Twenty percent of health vishors in this study had attended a course or lecture on chUd injury prevention in the preceding two years, compared to 15% of general practitioners and 7% of practice nurses. One national study of general practitioners found similar results wdth only 10% having undertaken injury prevention training in the preceding two years (Carter et al 1995). The higher knowledge scores of health visitors would therefore be consistent wdth the greater degree of trairung in this subject received by this professional group. The relationship between education and knowledge is also apparent amongst general practitioners in this study wdth a higher knowledge score amongst those who had a postgraduate quaUfication in paediatrics, those regularly undertaking child health surveUlance as assessed by being on the chUd health **surveillance** Ust of the **FHSA** and those with at least six months experience in hospital paediatrics.

4.4.5 Attitudes towards injury prevention

The responses to individual **attitudinal** statements and the overaU attitude scores indicated that health visitors had a signuficantly more positive attitude towards childhood **unintentional** injury prevention that either general practitioners or practice nurses, and that practice nurses had a significantly more positive attitude than general practitioners. Interestingly, although the proportion of practitioners beUeving most accidents were preventable was sunUar across aU groups, the greatest variation in responses on the attitudinal section of the questiormaire was for the statement conceming beUef in self efficacy in **preventing** unintentional injuries. Here only 26% of general practitioners beUeved they could be effective, whUst 46% of practice nurses and 90% of health visitors beUeved they could be effective in preventing childhood injuries.

At present there are only five pubUshed studies addressing the issue of attitudes towards injury prevention amongst primary health care team members in the United Kingdom; two concerning general practitioners (Carter and Jones, Carter et al 1995) and three concerning health visitors (Laidman 1987, Elkui and Watt 1995, Carter et al 1992). None of these studies compare attitudes between members of the primary health care team.

The first study of general practitioners' attitudes towards injury prevention by Carter and Jones, reports a questiormaire survey of 277 general practitioners in North Staffordshire. The response rate was 75% but although the characteristics of responders were coUected as part of the study, the figures for most characteristics are not reported, hence a comparison could not be made wdth the characteristics of responding general practitioners in this study. The main findings of the study were that less than a quarter of general practitioners felt they did enough chUd accident prevention work. Sixty percent of respondents felt that child health surveillance clinics and home visits were appropriate settings for general practitioners to mention accident prevention. Only forty percent of respondents felt they had enough background information on accidents and their prevention. No significant associations were found between occupational characteristics (such as experience of working in an A&E department, postgraduate quaUfications and being on the FHSA Child Health SurveiUance Ust) and attitudes towards child injury prevention.

A simUar questionnaire was designed and mailed to a random sample of 2000 general practitioners in the UK by Carter and coUeagues between **1993** and **1994** (Carter et al 1995). The characteristics of respondmg general practitioners, (which were sunUar to the characteristics of general practitioners nationaUy), suggested the respondents were sunUar to those m the study reported in this thesis m terms of age, sex, proportion of smgle handed practitioners, being on the FHSA ChUd Health SurveUlance Ust, havdng postgraduate quaUfications in paediatrics and distance from the nearest accident and emergency department. The results from this larger national study were simUar to those from the Staffordshire study wdth 77% of respondents considering mjury prevention to be part of **their** role but orUy 28% feeling they did enough mjury prevention work. Female respondents were more Ukely to beUeve that mjury prevention was part of the doctor's role; shnilar to the findmg that the attitude score was higher for female than male general practitioners m this study. Once again chUd health surveiUance clinics and home visits were seen as appropriate tunes to give injury prevention advice wdth smular proportions of general practitioners agreeing on the appropriateness of injury prevention advice in these settmgs as in this study. Seventy six percent of general practitioners feh it was important to mention injury prevention in a consultation to freat an acute injury, sunUar to the percentage found in this study. None of the other attitudmal statements used in this study were comparable to those used in either of **Carter's** studies (Carter and Jones **1992,** Carter et al **1995),** so no fiirther comparisons **could** be made. The sunUarity of responders in terms of personal and practice characteristics between this study and Carter's national sample suggests these residts may be appUcable to general practhioners outside Nottmghamshire. Also the sunUarity of responses conceming appropriateness of mjury prevention advice im different settings and the findmg m both studies that women practitioners had more positive attitudes suggests that the attitudes of doctors im Nottmghamshire may be, at least in terms of some aspects of injury prevention, simUar to those of general practitioners nationaUy.

The first study addressing attitudes of health visitors towards injury prevention was that by Laidman undertaken between 1984 and 1986. This study involved detailed interviews, questiormaires and discussion groups with an unspecified number of health visitors in two health districts and meetings wdth health vishors im 32 other health districts to discuss their injury prevention work and to observe their practice. No mformation is provided on the questions used during the interviews, group discussions or meetings and a copy of the questionnaire for health visitors is not mcluded in the report. The characteristics of health visitors mcluded im the study are not described. The objective of the study was to explore the potential for more effective involvement of health visitors in child accident prevention, not to systematicaUy mvestigate the attitudes of health visitors towards chUdhood mjury prevention. Consequently although comments conceming health visitor attitudes have been made in the report, they are not supported by any quantitative data and as such can only provide a general discussion on perceptions of health visitors' attitudes towards injury prevention. The report comments that safety was seen as a priority by health visitors wdth home visits being reported as the ideal time to carry out injury prevention. Some health visitors were reported as not feeUng personaUy motivated enough to carry out specific safety home visits. Many health visitors were reported as feeling it was important to receive notification from the hospital about chUdren on **their** caseloads who had been in hospital foUowdng an injury. It was also noted that the health visitors reported that the post-accident visit was "not the easiest vish they had to carry out".

Carter and coUeagues have also **undertaken** a survey of 96 health visitors in North Staffordshire in **1991** wdth the objective of examining the manner and extent to which health visitors were involved in chUd accident prevention (Carter et **al** 1992). One section of the questiormaire was concemed wdth attitudes to injury prevention. Only 12% of responding health visitors feh they did enough injury prevention work. AU responding health visitors were positive about mentioruing the topic of accident prevention before a **child's** first **birthday**. Sixty three percent reported they would deliberately mention the topic on three or more occasions during contact with parents. Seventy one percent would give preventive advice if they visited a famUy following notification of an accident. Fifty six percent of health vishors feh **they** had enough **background** information available on accidents. The characteristics of health visitors in the Staffordshire study were similar to those in this study in terms of age and years of practising as a health **visitor**. The attitudinal questions are not directly comparable to those used in this study, but this study does indicate that the majority of health visitors are in favour of initiating discussions wdth parents on this topic, simUar to the high percentage of health visitors agreeing that accident prevention shoidd be discussed in child health surveUance consultations in this study. Similarly, the high percentage of health vishors stating that they would give preventive advice at a post accident foUow up vish, is Ul accord wdth the **71%** of health visitors in this study who agreed that it is important for health vishors to undertake post accident foUow up visits to discuss injury prevention. Therefore although the results are not directly comparable, they do indicate that health visitors hold positive attitudes towards at least some injury prevention activities.

Ehiri and Watt undertook a smaU interview survey of 57 health visitors working in Clydebank and Glasgow to determine health visitors' perceptions of their role in chUd home accident prevention during 1992. AU but one health visitor reported havdng a role in the prevention of chUd home accidents. Forty seven percent felt it was difficuh to raise and discuss chUd home safety with famUies because they felt famiUes would see them as being critical, a sentiment echoed by some of the health visitors in Laidman's study. Some of the health visitors felt home safety was not a priority for the fanuUes they visited, again a statement echoed by the health visitors in Laidman's study. Ninety four percent of respondents were of the opinion that their home safety education had not been effective in reducing chUd home accidents or in changing the home safety behaviour of parents.

Ninety percent of health visitors in this study beUeved they could be effective in preventing childhood unintentional injuries, compared to 94% of the health visitors in Ehiri and Watt's study beUeving their home safety education had not been effective. There may be several reasons for these apparently contradictory findings. Firstly Ehiri and Watt's study concentrated on home safety education. No description of the health education model used in home safety education was given, nor whether this was used in isolation, or with other approaches such as the provision of home safety equipment. The question used in this study did not specify the use of one particular approach to injury prevention, so heahh visitors may have responded more positively because other approaches to injury prevention may be more effective than health education used in isolation (Towner 1995, Towner et al 1993, Towner et al 1996, Pless 1993). Also the question in this study focused on health visitors beUefs about whether they could be effective, not whether they had been effective in preventing injuries. Health visitors may see themselves as having the potential to be effective but may not see themselves as currently undertaking effective practice for a variety of reasons which wdU be discussed later when considering barriers to injury prevention. Also individual health visitors will not be able to demonstrate reductions in injury frequency within their caseload, even with an effective intervention, because the number of injuries wiU be relatively small. Finally Ehiri and Watt's study was undertaken before the pubUcation of the Health of the Nation (Department of Health 1993a) and before specific training resources for health visitors in injury prevention (Child Accident Prevention Tmst 1991b, Carter and Kenkre 1994) are Ukely to have had an impact on awareness amongst health visitors of potentiaUy effective injury prevention interventions.

The finding in this study that the majority of health visitors believed notifications from the liaison health visitor in the accident and emergency department to be useful, is simUar to Laidman's finding that health visitors regarded notification from the hosphal about chUdren on their caseload to be important (Laidman 1987). Also the finding by Laidman that some health visitors did not feel sufficiently motivated to undertake specific home safety visits (Laidman 1987) is simUar to the finding in this study that the statement with the least positive response by health visitors concemed the appropriateness of health visitors undertaking home safety checks to identify hazards in the home.

The responses of health visitors to the attitudinal statements in this study suggest that positive attitudes are held by the majority of health visitors to most aspects of their role in chUdhood injury prevention. It is not surprising that attitudes amongst health visitors are more positive than those amongst general practitioners or practice nurses as the role of health vdsitors in injury prevention is better defined than that of the two other groups (Laidman 1987, Levene 1992, Lowe 1989, Maclnnes 1985, Carter et al 1992, Morgan and Carter 1996b). Also injury prevention was found to be included in health vishor training courses by both Laidman and Morgan and Carter (Laidman 1987, Morgan and Carter 1996a), but none of the studies relating to injury prevention and general practitioners have addressed the issue of inclusion of injury prevention training in the undergraduate or vocational ttaining scheme curriculae. Morgan and Carter found some practice nurse trairiing courses did include injury prevention, but this was not standard practice across aU courses (Morgan and Carter 1996a). Consequently less positive attitudes may be expected amongst these professional groups. In-service training in injury prevention was also not found to be standard practice by any of the studies relating to health visitors, commuruty nurses or general practitioners (Laidman 1987, Carter et al 1992, Carter and Jones 1993a, Carter et al 1995, Morgan and Carter 1996a). One thud of health visitors in this study had attended a course or lecture on chUdhood unintentional injury prevention in the preceding two years, perhaps indicating mcreased avaUabUity of such training opportunities (ChUd Accident Prevention Tmst 1991b) or an increased mterest in undertaking such trammg amongst health vishors. The greater experience of injury prevention training amongst health visitors may play a part m mcreasmg confidence in undertaking mjury prevention activities and beUef m self-efficacy in mjury prevention, both of which may foster a more positive attitude.

It may also be expected that the health visitor would hold a more positive attitude towards injury prevention as the focus of heahh visitmg is on disease prevention and health promotion rather than diagnosis, treatment or care (Laidman 1987). This is supported by the findmgs of two recent surveys of health vdsitors which demonstrated positive attitudes towards health promotion and health education (Hayes 1990, Littlewood and Parker 1992) Furthermore the emphasis on home visiting wdthin health visiting is seen as providing greater opporturuties for injury prevention work (Laidman 1987, EhUi and Watt 1995, ChUd Accident Prevention Tmst 1991b, Roberts et al 1996, Kendrick 1994b) than amongst other PHCT members who have fewer contacts with children and famiUes at home. The existence of opporturuties for injury prevention, as weU as the positive attitudes towards health promotion in general, may both foster positive attitudes towards mjury prevention. FmaUy Laidman amongst others (Levene 1992, ChUd Accident Prevention Tmst 1991b, Kendrick 1994b) has suggested that health vdsitors have detailed knowledge about mdividual children and famUies as a result of good relationships they have developed over a period of working with that **family** which they can then use as a basis for injury prevention work. The existence of a good working relationship with a famUy may facUitate raising the potentially difficuh or threatening topic of injury prevention, which may also play a part in fostering positive attitudes towards injury prevention amongst health vishors.

The less positive attitudes towards injury prevention found amongst general practitioners in this study and also in the two by Carter and coUeagues (Carter and Jones 1993 a, Carter et al 1995) may reflect the less weU defined role of general practitioners in injury prevention. It is interesting that in both Carter's national study (Carter et al 1995) and this study, general practitioners favoured giving injury prevention advice in consultations for acute injury, with more general practitioners favouring this than giving advice in child health surveiUance consultations in this study. This would suggest that giving injury prevention advice may be perceived as being easier for general practitioners if it is associated with the tteatment of an injury, than if preventive advice is being given in isolation. This may reflect the conflict between the reactive and proactive role of general practitioners, with reactive usually acute care, being perceived as the 'traditional' role of general practice and often also taking precedence over proactive or anticipatory care (Kottke et al 1993). This wdll be discussed in more detail in terms of barriers to injury prevention practice.

The emphasis on prevention and health promotion in primary care had until October 1996 been on coronary heart and cerebrovascular disease as part of the health promotion banding system, which provided practices wdth remuneration for the collection of data on risk factors for these conditions. The majority of practices recieved the maxUnum level of payment, and the banding system proved successfid in terms of increasing data coUection (LeTouze and Calnan 1996). The lack of financial recognition for health promotion work in areas other than coronary heart and cerebrovascular disease prevention will have served as a disincentive to primary health care teams in undertaking such work, and may have contributed to the less positive attitudes of general practitioners and practice nurses towards injury prevention. The new arrangements for health promotion in general practice now aUow each practice to determine it's own priorities, based on the Health of the Nation, local priorities and best evidence. This may help in removing the financial disincentive to undertaking injury prevention in primary care and may foster more positive attitudes towards injury prevention.

Much has been written about low morale amongst general practitioners in recent years. The introduction of the 1990 contract for general practitioners and an increasing workload are two of the reasons often cited for the low morale (McBride and Metcalfe 1995, Kirwan and Armstrong 1995, Sutherland and Cooper 1992). Free text comments from respondents in Carter's national study (Carter et al 1995) suggest that these factors may also be influencing the attitudes of general practitioners towards injury prevention:

> "unless someone does something about the unending demand we wiU not be able to develop fiirther services"

> "given the hours in the day and the demand of patients and the government and the workload of GPs, we honestly have enough to do!"

> "we have enough work dealing with ill patients and preventive medicine as forced on us by the new contract without having more loaded on us"

Despite the numerous reasons for general practitioners to hold less than positive attitudes towards injury prevention, both this study and Carter's studies in North Staffordshire and nationally (Carter and Jones 1993a, Carter et al 1995) both demonstrate positive attitudes towards at least some injury prevention activities. Even if all non respondents to this survey were assumed to hold negative attitudes to all attitudinal statements, the overall results would still indicate that more than one third of general practitioners agreed that they should give advice about safety in child health surveillance consultations, more than 40% that they should give first aid advice in consultations for acute injury and more than 50% that they should give injury prevention advice in consultations for acute injury. These findings are encouraging in terms of the future involvement of general practitioners in injury prevention .

There are so far, no published studies of practice nurses attitudes in injury prevention with which to compare this study. The characteristics of the practice nurses in this study are similar to those in previous surveys of practice nurse occupational characteristics (Peter 1993, Hibble 1995, Greenfield et al 1987), workload (Hibble 1995) and views of health promotion (Bradford and Winn

1993), suggesting that as a group they are similar in terms of occupational and sociodemographic characteristics to practice nurses elsewhere. Several studies have found that practice nurses were undertaking aspects of health promotion and disease prevention; primary prevention such as immunisations and famUy planning, secondary prevention such as well person checks, smoking cessation, or weight control, or tertiary prevention such as control of diabetes or hypertension (Peter 1993, FGbble 1995, Greenfield et al 1987, Bradford and Winn 1993, Robinson and Robinson 1993) None of the studies record any injury prevention advice.

Two of the studies report practice nurses undertaking first aid (Peter 1993, Hibble 1995) and one reports practice nurses assisting in resuscitation (Greenfield et al 1987). Ordy one study assesses attitudes towards health promotion (Bradford and Winn 1993), concentrating on comparing various models of health promotion. The educational model (defined as "promoting an understanding of health issues enabling patients to make an informed choice) was the model most commonly preferred by the responding nurses, wdth the social change model (defined as "working to change poUtical and social environments to make healthier choices easier choices) the model least commonly preferred. However, 55% of nurses agreed that health promotion should include meeting people to work together to change health poUcy. Although these results caimot be directiy compared with this study, the findmgs concenung the preferred models of health promotion are interesting, and of relevance to injury prevention, and wdU be discussed later with regard to barriers to injury prevention. The fact that none of these studies have covered any injury prevention activities except giving first aid advice and assisting at resuscitation Ulustrates the lack of a well defined role for practice nurses in injury prevention. This being so, the finding that more than two thirds of practice nurses hold positive attitudes towards some prevention activities is encouraging, suggesting potential for increased practice nurse involvement in injury prevention in the fiature.

For both general practitioners and health vdsitors there was a weak positive conelation between knowledge and attitude scores with an increasingly positive attitude being associated wdth increased knowledge scores. A significant conelation did not exist for practice nurses. It might be expected that those wdth a greater understanding of the nature and extent of chUdhood uriintentional injuries would hold more positive attitudes towards their prevention (Fishbein and Ajzen 1975). The practice nurses had the lowest knowledge score and one possible explanation is therefore that the relationship between knowledge and attitudes is not a simple linear one, and that a threshold of knowledge may need to be reached before an association exists with attitude. The number of practice nurses in this study with high knowledge scores was too smaU to investigate this hypothesis further. Examination of the scatter plots of knowledge and attitude scores for each professional group (shown in Appendix F) indicates that there is less variability in the knowledge and attitude scores for practice nurses than for general practhioners, which will limit the ability to demonstrate a correlation If the tools used to measure knowledge and attitude had been more discriminating, it is possible that a conelation may have been demonstrated.

4.4.6 Current practice

In terms of cunent practice m mjury prevention all professional groups reported undertaking some injury prevention activities. Where comparisons were made between the three professional groups significantiy more health vdsitors than either general practitioners or practice nurses reported undertaking each activity. Health visitors also had a significantly higher numbers of contacts wdth other professionals or agencies regarding child safety than either general practitioners or practice nurses. Some comparisons between self reported practice in this study and m those undertaken by Carter (Carter et al 1992) and Ehui and Watt (Ehiri and Watt 1995) are possible. Eighty five percent of health visitors m Carter and colleagues survey used leaflets or booklets relating to injury prevention in their work, although they were not asked to specify the frequency with which they did so. Ehui and Watt found that 92% of health visitors reported using leaflets in their discussions on safety with parents, again, the health vishors were not asked to specify the frequency wdth which such Uterature was used. In this study, 43% of health visitors reported they always or often gave parents safety leaflets during discussions on injury prevention and a fiirther 42% reported they sometimes did so, producing comparable figures to the studies mentioned above, but highlighting that using Uterature was not an activity that was systematicaUy undertaken wdth aU parents.

Carter and coUeagues and Ehiri and Watt found sunUar percentages of health vdsitors reporting that they took action on notifications received from the liaison health visitor (13% and **17%** respectively). Forty eight percent of health vdsitors ín this study reported they always or often undertook post injury foUow up vishs. This higher proportion may índicate over reporting, increased activity, the ínfluence of the recent production of traüúng materials specificaUy addressing post accident foUow up visits (ChUd Accident Prevention Tmst **1991b)** or the effects of local health poUcy. It is not possible reach any fiirther conclusions regarding the apparent increase in activity in this area on the basis of the findings from this study.

The findíng that health vdsitors more frequently undertook a range of injury prevention **activities** than either general practitioners or practice nurses is not **surprising** considering that **their** role ín ínjury prevention is more well defmed than that for the other two professional groups. In **addition,** as already discussed **their** role focuses on health promotion and disease prevention, **unlike** general practitioners who have traditionaUy had a reactive disease oriented role. Although practice nurses are having an increasing role in health promotion, studies of **their** workload suggest the majority of their time is **still** spent on traditional treatment room tasks (Peter 1993, Hibble 1995, Greenfield et al **1987)** with health promotion being a relatively "new" activity for most nurses.

The activdties reported as occurring most frequently by health visitors íncluded identifying hazards in the home on home visits and giving advice about safety equipment in child health surveUlance contacts. One third of health vishors sometimes or never gave advice about safety equipment and twenty percent only sometiunes identified hazards in the home on home visits. This suggests that these practices are not being systematicaUy undertaken in routine health visiting practice. When one considers that the self reported practice is Ukely to be an overestimate of actual practice, there is considerable scope for increasing health visitor **injury** prevention activity.

The activities reported least frequently were working with a local chUd safety group and lobbying or campaigning on chUd safety. Comparing the most and least frequently undertaken activities, it would seem that those involving the preventive model of education (Tones et al **1990)** are those most often undertaken, and perhaps also in isolation, as ordy 49% of health visitors would also give advice about local safety equipment loan schemes or local stockists when advising on safety equipment. There seems Uttle evidence to suggest that injury prevention is being undertaken using a systematic approach or a range of injury prevention approaches or models of health education. This is conceming as the use of a systematic approach to health promotion and disease prevention has been found to be associated with increased effectiveness of a prevention programme (Kottke et **al 1993,** Pommerenke and Dietrich **1992a,** Pommerenke and Dietrich **1992b)** and **injury** prevention interventions using a range of injury prevention approaches have been demonstrated to be more effective than those relying on an educational approach in isolation (Towner et al 1993, Towner et al **1996,** SpeUer et al 1995, Popay and Young **1993,** Pless **1993,** Kendrick and Marsh **1994)**.

The activdties most commonly reported as being undertaken for general practitioners and practice nurses were displaying posters and leaflets on injury prevention in the surgery waiting room, foUowed by reporting concems about chUd safety to another member of the PHCT for general practitioners, and giving first aid and injury prevention advice in consuhations for acute injury for both general practitioners and practice nurses. The activities undertaken least often for general practitioners and practice nurses were lobbying or campaigiing on a local safety issue, working with a local child safety group and coUecting and analysing data on chUdhood injuries. Similar conclusions can be drawn for general practitioners and practice nurses about the lack of a systematic approach to injury prevention and the reUance on the educational approach, most commonly using a preventive model of health education.

Previous studies of health vdsitors and practice nurses support the finding that ahhough positive attitudes are held towards health education models other than the medical model, in practice this is the model most commonly used (Bradford and Winn 1993, Littlewood and Parker 1992). Studies amongst general practitioners suggest that health promotion and disease prevention is most likely to occur opportunistically than systematicaUy on a popiUation basis (Calnan and Williams 1993, Comey 1993). Carter and colleagues comment in the report of their national survey of general practitioners that "prevention advice tends to be offered opportunistically and sporadically" (Carter et al 1995), supporting the findings of this study. None of the studies conceming general practUioner attitudes towards prevention have examined or discussed attitudes towards differing models of health education so no comparisons regarding this aspect of health promotion can be made with this study.

One of the most mteresting finding of this study is the difference between attitudes and practices amongst all professional groups. For every self reported practice, only a proportion of those agreemg or sfrongly agreeing that an activity should be undertaken, report that they always or often undertake that activity. This proportion was lower for general practitioners and practice nurses than heahh visitors for activities which were comparable across all three professional groups. The largest differences between attitudes and practice for general practitioners and practice nurses were for lobbying or campaigiung on safety issues, coUecting injury data and discussing safety equipment in child health surveUlance consultations. The difference was smaUest for displaying posters and leaflets. For health visitors the difference was also greatest for lobbying or campaignmg and least for identifying hazards in the home on home visits and discussing safety equipment in child health surveUlance consultations. These differences between attitudes and practices are mteresting because they may indicate that there are barriers to undertaking injury prevention in primary care.

4.4.7 Barriers to injury prevention in primary care

Although this study did not specificaUy ask about barriers to injury prevention in primary care, the gap between attitudes and practices demonstrated in this study suggests that barriers do exist which are Umiting injury prevention in primary care. If the primary health care team is to develop it's role in injury prevention, it is

Unportant that the barriers to doing this are examined, and possible solutions are considered.

Previous studies on attitudes towards injury prevention amongst health vishors and general practhioners have suggested a series of possible barriers to injury prevention; lack of time (Laidman 1987, Carter and Jones 1993 a, Carter et al 1992, Carter et al 1995), lack of resources such as reading or educational material (Carter and Jones 1993a, Carter et al 1992, Carter et al 1995), lack of knowledge (Laidman 1987, Carter and Jones 1993a, Carter et al 1992, Carter et al 1995), perceptions of injury prevention as being a difficult issue to raise with famiUes (Laidman 1987, Ehiri and Watt 1995, Coombes 1991), or lack of beUef in self efficacy in injury prevention (Ehiri and Watt 1995, Leveque et al 1995).

Similar findings emerge from studies addressing barriers to preventive work in general rather than injury prevention in particular; a lack of time (Bouhon and WilUams 1986), a lack of confidence in undertaking an activity (Weschler et al 1983, Bruce and Bumett 1991), a perceived lack of competence (Boulton and Williams 1986, Wood et al 1989), a perception of a lack of efficacy of their preventive work (Bmce and Bumett 1991, Moser et al 1991), a concem that preventive work might be viewed negatively by patients (Boulton and WUliams 1986, Williams et al 1989) and the traditional reactive role of the general practitioner rather than the proactive role (Kottke et al 1993) are all factors which have been identified as Umiting the preventive activity of primary care physicians. SinUar findings emerge from surveys of community nurses with lack of training or knowledge (Morgan and Carter 1996a, Hayes 1990), lack of time (Hayes 1990, Littiewood and Parker 1992), lack of fiinding (Hayes 1990) or a perception that patients resented unsoUcited advdce (Littlewood and Parker 1992) all being cited as barriers to preventive work. Each of the perceived barriers will be discussed below.

Lack of tune is frequentiy given as a reason for not undertaking various activities in primary care. Health care needs assessment may be used to help prioritise which activities the team shoidd undertake. Two of the key tasks in undertaking a needs assessment are to determine the incidence or prevalence of a condition and to estabUsh the presence or absence of effective interventions for that condition (NHS Management Executive 1991). Data on childhood mortaUty and morbidity from unintentional injury demonstrates the importance of unintentional injury as a major child health problem (Office for National Statistics 1996, Department of Trade and Industry 1996, Royal College of General Practitioners 1995). The evidence regarding the effectiveness of primary care injury prevention programmes demonstrates that most programmes have reported positive outcomes in terms of reductions in hazards, changes in safety behaviour, increases in use of safety equipment and more rarely reductions in injury frequency (Bass et al 1993, Roberts et al 1996, Towner et al 1993, Towner et al 1996, SpeUer et al 1995, Popay and Young 1993, Kendrick and Marsh 1994). It can therefore be argued that unintentional injury is an important child health problem for which some effective primary care interventions exist, and on the basis of this should be prioritised by primary health care teams. The implication of this is that tune and resources should be made available for injury prevention at the expense of other activities which are responsible for less mortaUty and morbidity, or those for which only less effective interventions exist. Despite the advent of fundholding where primary health care teams are charged with the responsibihty of assessing the health care needs of their practice popvdation and providing or purchasing services to meet those needs, a recent report by the Audit Commission found Uttle evidence of such activity amongst fimdholding practices (Audit Comnussion 1996). Needs assessment in primary care in therefore unlikely to significantly impact upon the tune avaUable for mjury prevention.

It is therefore important that the tune required for injury prevention activdty in primary care can be reaUsed from tune cunently being spent on child health activities. The third edition of the HaU report "Health For All ChUdren" (HaU 1996) makes specific recommendations about the primary care chUd health surveUlance programme, which reduce the number and frequency of examinations from previous recommendations, but increases the emphasis on chUd health promotion, mcluding injury prevention. Depending on local child health poUcy, this may free up some tune for mjury prevention m primary care.

A lack of knowledge, skills or confidence is also frequently cited as reasons for not undertaking mjury prevention. Health vdsitors are most Ukely to have received some training on the subject during their pre registration training, and fiirther in service training foUowdng quaUfication than either general practhioners or practice nurses. There is some evidence that this training is of a variable quality (Laidman

1987, Morgan and Carter 1996a). Training resources have been produced (Child Accident Prevention Tmst 1991b, Carter and Kenkre 1994) which would be suitable at both the pre-regisfration and post quaUfication level for health visitors, for practice nurses pre and post quaUfication and also for undergraduate and post graduate medical education. At the level of a Health District, the chUdhood injury prevention strategy should recognise the current lack of knowledge and skills in this area amongst primary health care team members and identify appropriate training opportunities. With the devolvement of training budgets to individual practices, practices can then choose how to use that budget, and to purchase injury prevention ttaining if they have identified that as one of their priorities. The District strategy for injury prevention should also address the issue of the inclusion of injury prevention in the curricula for training health vdsitors, practice nurses and general practitioners in child health surveillance.

Several studies have identified a lack of beUef in self efficacy or perceived competence to be barriers to undertaking injury prevention activdties. The beUef that a practitioner holds regarding their effectiveness in a particular situation is likely to be an influential factor in determining the activity undertaken in such a situation (Fishbein and Ajzen 1975, Bandura 1977, Bandura 1978). If general practitioners, and practice nurses, to a lesser extent, do not believe they can be effective in injury prevention, they are unlikely to undertake such activities. Several methods for increasing beUef in self efficacy have been identified. These include providing opportunities for personal accompUshment, providing vicarious experience of accompUshment, verbal persuasion and reducing anxiety associated with feeUngs of failure (Bandura 1977).

In terms of mjury prevention, the first could be achieved by estabUshing a system whereby poshive feedback is given to those undertaking injury prevention activdties for example, evaluatmg the effectiveness of giving advdce regardmg safety equipment by monitoring levels of use of local safety equipment schemes or surveying parents about possession of equipment as part of the child health surveillance programme. Providing experience of vicarious accomplishment of successfùl mjury prevention could be achieved by inexperienced team members "sitting in" wdth more experienced coUeagues, or by using videotapes of parents discussing the aspects of injury prevention they had found usefiil and the impact it had had on their safety practices. Verbal persuasion from a respected colleague could be used to mcrease beUef m self efficacy for example on practice vishs from health promotion facilitators, practice nurse faciUtators or the medical audit advisory group visits, by emphasising the evidence for the effectiveness of primary care mterventions. Finally fear of failure could be addressed in several ways. For example, during training sessions, participants could be given the opportunity to observe an experienced coUeague undertaking an activity, could role play undertaking the activity with coUeagues in a supportive environment and receive constmctive feedback; more experienced coUeagues could share their experiences of unsuccessfiil or difficuh injury prevention activdties and the lessons they learnt as a result of those experiences. Participants m training sessions could be foUowed up m theü" practices a short period after training to feedback their experiences on injury prevention in practice, to enable the reinforcement of good practice.

Addressing these issues in injury prevention training may help participants to increase theu beUef in their own self efficacy, and so increase their injury prevention activity.

Activities perceived by clinicians as Unproving the pubUc health may not be seen as beıng relevant to **their** role with ındividual patients, despite ıncreasıng emphasis on the convergence of the roles of pubUc health and primary care over recent years (Tudor-Hart 1988, Stone 1987, Bhopal 1995). The increasıng interest ın locality commissioruing (Department of Health 1996) may help shift the emphasis of primary health care away from practice populations towards communities, which may encourage the development of primary care services based on the needs of the local population, rather than the practice population (Tudor-Hart **1988)**. It may also be more successfiil to present injury prevention in terms of benefits to ındividual patients, such as usıng the numbers needed to treat approach (Sackett et al 1991).

Primary care physicians traditionally have had a reactive role responding to patients presenting complaınts, rather than being proactive or providing anticipatory care (Tudor-Hart 1988). Despite the increasing acceptance of the ınportance of anticipatory care over the last **15** years (Tudor-Hart **1988**, Royal College of General Practitioners 1982, Royal CoUege of General Practitioners **1983**, Department of Health and Social Security **1987)**, acute problems tend to take precedence over non acute problems. Research ın other areas of prevention suggests that the Unplementation of a systems approach to prevention can increase preventive activdty (Kottke et al 1993, Pommerenke and Dietrich 1992a, Pommerenke and Dietrich **1992b)**. Such an approach may **involve** the use of specific reminders to patient and cUnician at various stages of the patients progress through a health care facUity. For example for a child health surveUlance visit, a checklist of safety practices or safety equipment relevant to a chUd of that particular age could be included in the parent held chUd record. The receptionist could remind the parent to complete the Ust prior to seeing the health professional. The sheet to be completed by the heahh professional at the check could draw attention to the safety checklist and ask the health professional to indicate the injury prevention **undertaken**. Separate sheets could be used for different health professionals. Computerised practices could use templates containing the relevant information to give and request hems of information to be entered onto the practice database. The waiting room could advertise the local safety equipment loan scheme or the avaUabUity of second hand safety equipment. Using this approach each parent would have numerous reminders about injury prevention on each visit and receive reinforced safety messages from members of the primary health care team.

Preventive services by theu nature, often fail to provide positive feedback for the practitioner. One is rardy aware of an injury that has been prevented. At the level of individual practices it is urdikely that an injury prevention programme wiU **demonstrate** reductions in injury frequency, due to the smaU numbers of injuries involved. Positive feedback could be obtained by aggregating data from a group of practices, or by using process rather than outcome measures (Pommerenke and

Dietrich 1992b).

4.4.8 Models of injury prevention in primary care

This study has provided some evidence that activities based on a preventive model of health education (Tones et al 1990) are those viewed most favourably and those most commonly undertaken by members of the primary health care team. These findings add support to those from a survey of community nurses which found that although more than half the nurses feh it was important to meet with workers from other agendes to try and change health policy, the model of health education most commonly undertaken was the educational model (defined as "promoting an understanding of health issues enabUng patients to make an informed choice), with the social change model (defined as "working to change poUtical and social envdronments to make healthier choices easier choices) the model least commordy preferred (Bradford and Winn 1993). The models of health education used by members of the primary health care team require fiirther study, as there is evidence that parents are aware of the hazards faced by theu chUdren (Roberts et al 1995, Glik et al 1991, Sparks et al 1994) and that barriers exist preventing parents from undertaking injury prevention activities, such as financial barriers (Kendrick 1994a, Roberts et al 1995) lack of control over housing and local environmental conditions (Roberts et al 1995, ChUd Accident Prevention Tmst 1991a, Roberts 1996), a lack of confidence in the effectiveness of thdr teaching theu children about safety (Coombes 1991), frequent household moves (GeUen et al 1995), inexperience of chUd care (McClure-Martinez et al 1996) and a lower interaal locus of control (Greaves et al 1994). These findings suggest that using a preventive model of health education whereby information is provided for parents in order that they can make an informed choice about injury prevention may not be meeting the needs of these parents. Other models such as the self-empowerment model (empowering individuals to change thdr environment (Tones et al 1990) where parents are facUitated in undertaking injury prevention for example by providing access to low cost safety equipment, working with parents to increase self esteem or confidence in child care, helping parents apply for benefits or housing grants or in approaching the local authority about hazards in local authority housing may meet the parental needs for injury prevention more successfully. Using a radical-political model (Tones et al 1990) to achieve social or envdronmental change by bringing about political action may similarly meet the parental injury prevention needs to a greater extent than providing them with information and advice on safety. Studies of the effectiveness of injury prevention using such models are urgently required (Towner 1995).

4.5 Conclusions

This study has provided evidence that primary health care team members have some knowledge of chUdhood unintentional injury epidemiology, with health visitors displaying the greatest knowledge. Attitudes towards injury prevention were very positive amongst health vishors and less so amongst general practitioners and practice nurses, but a majority of both groups held positive attitudes towards some injury prevention activities. Health vishors were undertaking the most injury prevention activity, but most activities were not being undertaken on a systematic basis with aU famiUes. Activdties involving a preventive model of health education were undertaken most often. Those involving empowering parents or poUtical means were undertaken less often. General practitioners and practice nurses were undertaking some injury prevention activdty, most commonly within consultations for acute injury, and **opportunistically** rather than systematicaUy. The combination of using a preventive model of health education, often as an isolated approach, opportunisticaUy with parents may not achieve the greatest possible reduction in injury frequency. Further studies of primary health care team injury prevention provided using a systematic whole population approach and using a combination of health education models are required. If such studies are to be **succesful,** they must address the barriers to injury prevention in primary care.

5. Conclusions to be drawn from the studies presented in this thesis and recommendations for further research

The first study presented in this thesis has demonstrated that minor unintentional injuries in children do predict more severe urüntentional injuries resuhing in hospital admission, but targeting ïnjury prevention at such children, for example by post ïnjury foUow up visits will be Umited•m terms of its impact on reducing the burden of injury morbidity as most chUdren admitted to hosphal following an injury have not had a previous A&E attendance, repeat injuries are relatively rare occurrences and the effectiveness of post injury follow up visits remains to be demonstrated.

Previous work, supported by the findings of the third study presented in this thesis, suggests that few health visitors use the information provided by the paediatric liaison health visitor to constmct a picture of the local injury epidemiology, and in most cases the information provided is insufficient to identify fectors ïnfluendng ïnjury occurrence, hence severely restricting the utility of such data at a local level.

The role of the paediatric liaison health vishor in the notification of A&E attendances, the provision of post injury foUow up visits, the transfer of ïnformation between primary and secondary care and the use of notification data for other purposes in primary care are in need of fiirther consideration.

The second study presented in this thesis explored fiirther the utUity of **targeting injury** prevention at a group of chUdren identified as "high risk". The faUure of this study to find significant associations between many risk factors for injury and a range of injury outcome measures suggests that, at present, injury prevention programmes in primary care should not be targeted using such risk factors untU further work has confirmed or refitted this finding in a larger population with a wider cross section in terms of socioeconomic status. The resuhs of this study cannot, however, be extrapolated to more severe injuries, and fiirther work is needed in this area. The use of a population approach to chUdhood injury prevention in primary care is recommended at present.

The third study **presented** in this thesis provided evidence that primary health care team members have some knowledge of childhood unintentional injury epidemiology. Poshive attitudes are held towards chUdhood unintentional injury prevention especiaUy among health vdsitors, but even among general practitioners and practice nurses, poshive attitudes to at least some injury prevention activdties are held. Health vishors are **undertaking** the most **injury** prevention activity, but most activdties are not being undertaken on a systematic basis with aU fanUUes. Activities involving a preventive model of health education are undertaken most often. General practitioners and practice nurses are undertaking some injury prevention activity, most commonly within consultations for acute injury, and opportunistically rather than systematicaUy.

The combination of usińg a preventive model of health education, often as an isolated approach, opporturuśticaUy with parents may not achieve the greatest possible reduction in injury frequency.

The results of the three studies presented in this thesis and the review of the Uterature undertaken for this thesis, suggests that fiirther research examining the effectiveness of primary health care team ìnjury prevention interventions usìng a systematic whole population approach and usìng a combination of health education models is required. The positive attitudes towards injury prevention demonstrated in the third study presented here, suggest support may be found locaUy amongst primary health care teams for such a study.

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Appendices

Appendix A:

Information required by the Faculty of Medicine and Health Sciences for theses submitted for the Degree of Doctor of Medicine

Information required by the Faculty of Medicine and Health Sciences for theses submitted for the Degree of Doctor of Medicine.

Location of the work

The research presented in this thesis has been undertaken during the course of my work in the Department of PubUc Health Medicine at Nottingham Health Authority (1989-1991), the Department of PubUc Health Medicine at the University of Nottingham (1991-1995) and the Department of General Practice at the University of Nottingham (1995 onwards).

Degree of personal involvement, and involvement of others in the research presented in this thesis

Study 1

This study was unfunded. All work for this piece of research was undertaken by myself including the Uterature review, hypothesis formulation, design of the study and study protocol, data coUection, database design and data entry, data analysis and preparation of material for publication.

Help was received from the foUowing sources;

Advice on study design and statistics was provided by epidenuologists and statistidans from the Department of Public Health Medicine and Epidemiology at the Uruversity of Nottingham.

Nottinghamshire FHSA provided the Ust of commurüty controls matched on age and sex with the cases from theu register.

The information officer at Nottingham Health Authority used the PC-CAM mapping package to map the postcodes of cases and controls to wards.

Study 2

This study was also unfunded, and formed an extension of a piece of work undertaken by a medical student under my direct supervision for the Degree of Bachelor of Medical Science. The exact contributions of myself and the medical student are specified below;

The Uterature review, hypothesis formulation and study and protocol design were undertaken independently by myself

The questionnaire used for this study was designed by myself, but administered by the medical student. Advice on the design of the questionnaire was obtained from the ChUd Acddent Prevention Tmst and the members of the Nottingham Accident Prevention Group.

The database used for the analysis presented in this thesis was designed by myself

The original data entry for data from the questionnaire was undertaken firstly by the medial student and secondly by myself for verification purposes.

The data coUection for the cohort study has been undertaken by myself, and by a research assistant supervised by myself The research assistant helped wdth extraction of the medical records from local hospitals and extracted information on primary care attendances over the one year foUow up period from the primary care records using a data coUection sheet designed by myself.

AU hospital attendances and admissions were ascertained by searching the A&E module of the Patient Administration system at the local hospitals. This was undertaken entirely by myself

AU mjuries were scored for mjury severity using the AIS scale by myself

AU data conceming outcomes at the one year foUow up period were entered onto the database by myself

All analyses presented in this thesis have been undertaken by myself

The paper prepared for pubUcation from this study has been prepared by myself

The oral presentation of these results at the Third World Conference on Injury Control was prepared and given by myself

Study 3

This study was a fimded piece of research. The detaUs are given below:

Funding body	Department of Health
Funding provided	£31,000

Study titie;	**The "Keeping** ChUdren Safe" project
Project duration;	October **1993** - October 1994
Staff employed;	Research Assistant Grade **1B**
CoUaborators;	Professor **Idris** WiUiams Department of General Practice University of Nottmgham Maureen Morgan Assistant Director of Primary Care Nottmgham Community NHS Trust Trish Crowson Health Promotion Advisor North Nottmghamshire Health Authority

The contributions of myself, the research assistant and the coUaborators are outlined below;

The original idea for the project was mine. In addition I produced the fimding appUcation, includmg study objectives, study design and study **protocol** .

The **questionnaires** used in the study were designed by myself but pUoted and administered by the research assistant under my direct supervision. Advice on the design of the questioimaire was obtamed from the study coUaborators and the covering letters were signed by the coUaborators.

The sampUng frames were provided by the Nottinghamshire Health Authority and Nottingham and North Nottingham Community Health Tmsts.

The database was designed by the research assistant and modified by myself AU data were entered by the research assistant.

All analyses were undertaken by myself, or by the research assistant under my direct supervision.

Three of the papers for pubUcation were written by myself, the fourth written by the research assistant **under** my direct supervision. Advice on papers prepared for pubUcation was provided by the coUaborators.

Publications arising as a result of the research presented in this thesis.

The following papers have been published. Copies of the papers are included in Appendix B.

Kendrick D (1993) Accidental injury attendances as predictors of future admission. *Jornal of Public Health Medicine* 15(2): 171-174.

Kendrick D (1994) Role of the primary health care team in preventing accidents to children *British Joumal of General Practice 44:* 372-375.

Kendrick D, Marsh P, WUUams EI (1995) General practitioners: chUd accident prevention and the "Health of the Nation" *Health Education Research* 10(3): 345-353.

Kendrick D, Marsh P, WUUams EI (1995) How do practice nurses see their role in child injury prevention? *Injury Prevention* 1(3): 159-163.

Marsh P, Kendrick D, WiUiams EI (1995) Health visitors' knowledge, attitudes and practices in chUdhood accident prevention *Journal of Public Health Medicine* 17(2): 193-199.

Kendrick D, Marsh P (1997) Injury prevention programmes in primary care; a high risk group or a whole population approach? *Injury Prevention* 3(3): In press.

Appendix B:

Publications arising from research presented in this thesis

Printed in Great Britain

Accidental injury attendances as predictors of future admission

Denise Kendrick

Summary

A case-control study was carried out in Nottingham Health District to establish whether children under five years of age admitted to hospital after an accidental injury were more likely to have previously attended the accident and emergency (A & E) department than community controls. The subjects were 342 case-control pairs matched on sex and date of birth, consisting of children under five years resident in the Health District, and the main exposure measures were attendance at the A & E department before the case's first admission, type of injury and number of earlier attendances. It was found that after adjusting for social deprivation score and proximity to hospital, children who had been admitted after an accidental injury were twice as likely to have attended the A & E department than community controls, and were more likely to have had more than one earlier attendance. Odds ratios were significantly raised for soft-tissue injuries and lacerations. It is concluded that accidental injuries in pre-school children that require attendance at the A & E department predict accidental injuries requiring admission. Making attendances at A & E departments notifiable to health visitors would facilitate the undertaking of accident prevention work.

Introduction

Childhood accidental injuries arc the most common cause of death among children aged 1–14 years, accounting for 50 per cent of deaths in that age group. They result in 10 000 children being permanently disabled annually and in one in six children attending an accident and emergency (A & E) department every year.' With such large numbers of children coming into contact with health care workers at A & E departments, the potential for accident prevention could be considerable. If minor accidental injuries resulting in attendance at A & E departments were predictive of future, accidental injuries requiring admission, then directing accident prevention at those who have attended A & E departments could be of benefit.

Accidental injuries have been shown to predict future accidental injuries in pre-school children. Manheimer *et al.* undertook a case review of over 8000 children enrolled in a US health care plan, and found that the accident rate (detennined by admissions and attendances) in children aged four to eight years who had suffered three or more accidental injuries in the first four years of life was twice that of children with no history of accidental injury.[2] Data from the Oxford Record Linkage Study have been used to undertake a cohort study of accidental injuries in the under-fives. It was found that children with one earlier admission for accidental injury had a doubling of the risk of future admission for accidental injury when compared with children with no history of admission. By calculating accident risks in children who repeated accidents and in accident non-repeaters, accident repeaters were found to have a significantly higher first accident rate than non-repeaters; this result suggests that some children have a persistently raised risk of accidents.'

Data from the 1970 British birth cohort included health visitor interviews with the parents of over 10 000 children to determine history of accidental injury requiring medical attention. Children with three or more accidental injuries in the first five years of life were found to have a relative risk of 5·9 (95 per cent confidence interval (CI) 4·4, 8·8) of having three or more accidental injuries in the next five years of life.[4] Goldacre and coworkers, again using data from the Oxford Record Linkage Study, found that admissions for particular injuries, i.e. bums and poisoning, predicted future admissions for those same injuries.[5]

It has therefore been shown that admissions for accidental injuries predict future admissions for accidental injuries generally and for the specific injuries of bums and poisonings. Admissions and attendances for accidental injury have been shown to predict future admissions and attendances. Similarly, accidental injuries requiring medical attention predict future accidental injuries requiring medical attention. However, no work

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as yet has examined the relationship between accidental injuries requiring attendance and those requiring admission. This study examines that relationship.

Methods

A case-control design was used to test the hypothesis that children who have had an acddental injury requiring admission will not have had more attendances at the A & E department than community controls. A matching ratio of one to one was chosen because of the large number of children admitted each year aAer accidental injury in Nottingham. The sample size was calculated based on a power of 90 per cent, CI of 95 per cent, calculating an odds ratio of at least two and attendance at the A & E department of the control children at a rate of one in six per year.' This produced a figure of 282 case-control pairs.

Cases were defined as children under five years, and resident within Nottingham Health Authority boundary, admitted after their first accidental injury. The sampling frame for cases comprised all children under five years admitted after an accidental injury in 1990. Case data included name, age, sex, date of birth, address, postcode, date of first admission and admission injury.

Controls were defined as age- and sex-matched children, with no history of admission to a Nottingham hospital after accidental injury (ascertained from the computerized A & E records), and resident within Nottingham Health Authority boundary. Controls were obtained from the Family Health Services Authority (FHSA) register matched for sex and date of birth. Control data included age, sex, date of birth, address and postcode.

The confounding effects of non-accidental injury were reduced by excluding all cases and controls who had ever been on the child protection register. The confounding effects of social factors and proximity to hospital have been adjusted for in the analysis, using deprivation scores and proximity to hospital.

Information on attendance at the A & E department after an accidental injury was obtained by searching the computerized A & E records. Details were obtained from the records of cases and controls of number of attendances before the date of the case's first admission for accidental injury, dates of attendances and injuries incurred. It was possible to exclude medical reasons for attendance or admission, and follow-up visits for wound dressing, etc, as diagnosis and treatment for each attendance were recorded.

Data on postcode have allowed the proximity to hospital to be calculated. Addresses have allowed deprivation scores based on the Nottingham County Council Deprived Area Study to be calculated.[6] Thi deprivation index was chosen rather than other nationa indices, as it has the advantage of being locally appli cable.

TABLE 1 Age and sex distribution of cases and controls : date of case's first admission (percentages given in parer theses)

Age (years)	Male	Female	Total
Under 1	33	35	68(19-9
1	58	46	104 (30-4
2	45	33	78 (22-8
3	23	28	51 (14-9
4	26	15	41 (120
Total	185 (54·1)	157 (45·9)	342 ;

TABLE 2 Distribution of cases and controls living in deprive< areas (percentages given in parentheses)

Deprivation score	Cases	Controls	Tota
Below average deprivation	162 (47·2)	201(58-6)	363
Moderate deprivation	54(15-7)	33 (9·6)	87
Severe deprivation	50(14-6)	31(90)	81
Extreme deprivation	61(17-8)	59 (17·2)	120
Unclassified	15 (4·7)	18(5-5)	33
Total	342	342	684

$\chi^2 =$ 13·74 with 4 degrees of freedom. p=0003.

TABLE 3 Proximity to hospital of cases and controls (per centages given in parentheses)

Proximity to hospital	Cases	Controls	Total
Less than 1 mile	6(1·8)	5 (1·5)	11
1 -2 miles	52 (15·2)	61 (17-8)	113
>2-5 miles	167 (48·8)	152(44-4)	319
>5–10 miles	74(21·6)	86(25-1)	160
>10 miles	5(1-5)	13 (3·8)	18
Postcode unavailable	38 (11·1)	25 (7-3)	63
Total	342	342	684

χ^2=8·65 with 5 degrees of freedom, p>0-05.

TABLE 4 Odds ratio for all Injuries and for specific attendance injuries

Attendance injury	Number of esses attending A & E	Number of controls attending A & E	Odds ratio	95% CI
All injuries*	114	70	1·98	1·32, 2·96
Soft-tissue injury	30	13	2-3	1·04, 5·17
Lacerations	35	23	2-02	1·01, 4·04
Head Injuries	39	13	2·23	0-97,5·17
Bums	14	8	1·92	0·59, 6·22
Othert	31	17	1·84	0-82.4·10

• The number of cases and controls attending A&E department for specific injuries is greater than the total number of children attending because some children had more than one attendance.
t Fractures, ingestions. inhalations, foreign bodies and bites.

Differences in proximity and deprivation scores between cases and controls have been analysed using the χ^2 lest. Conditional logistic regression analysis, adjusting for proximity and deprivation score, has been used to calculate odds ratios and 95 per cent CIs using the EGRET program.[7]

Results

A total of 342 case-control pairs were identified from the sampling frame and all were entered into the study. Table 1 shows the age and sex distribution of cases and controls. Significantly more cases than controls lived in a deprived area (Table 2). No significant difference in proximity to hospital was found between cases and controls (Table 3).

After adjusu'ng for deprivation score and proximity, significantly more cases had attended the A & E department than controls (odds ratio I -98. 95 per cent CI 1·32, 2·96). Overall, 114 cases (33 per cent) had a history of previous attendance after an acddental injury. Cases were also more likely to have had more than one earlier attendance than controls (odds ratio I ·71, 95 per cent CI 1 ·28, 2·26). At the level of individual injuries requiring attendance, odds ratios arc significantly raised for soft-tissue injuries and lacerations (Table 4).

Discussion

This study has shown that minor acddental injuries not requiring admission predict subsequent acddental injuries requiring admission. Although admission to hospital may be determined by factors other than severity of injury, factors such as sodal deprivation, proximity to hospital and history of non-accidental injury have been adjusted for in the analysis. It is possible that bed availability could determine admission rather than severity of injury: similarly, management protocols could influence admission, but none were in existence during the period of this study. Measuring injury severity scores for all children attending the A & E department and for those admitted would provide the answer to whether the attendances at the A & E department represented more minor injuries than the admissions, and this represents the next stage of this work.

The odds ratios for the injury sub-groups are very similar and reached significance for only two sub-groups. The inability of this study to detect significant odds ratios for injuries other than soft-tissue injuries and lacerations is likely to be explained by insufficient power to detect differences when the numbers of spedfic injuries were small.

The implications of this research are that acddental injuries requiring attendance are important not only for the suffering they cause but, more importantly, because they predict acddental injuries requiring admission. Goldacre and coworkers' have argued that acddent prevention should be directed at children who have been admitted after an acddental injury. The present study suggests that this argument should be extended to all those attending an A & E department after acddental injury, as these children arc at an increased risk of having an acddental injury requiring admission.

The role of the health visitor in childhood acddent prevention is achieving a high profile.*'" Health visitor intervention has been shown to be effective both in rrdudng repeated acddent rates[10] and in encouraging parents to make safety changes to thdr homes." As one-third of all children admitted after an acddental injury have a history of A & E attendance, health visitor intervention has the potential to reduce such admissions by one-third. Such intervention can be undertaken only if health visitors have adequate knowledge regarding acddents to children on thdr caseload, preferably including how the acddent happened and type and severity of injuiy. On the basis of this study, health visitors should be notified of all acddents to children on their caseload that required A & E attendance. This would allow health visitors to identify such children as having an increased risk of an acddental injury requiring admission. This could then be used as part of a multi-factorial assessment of risk on which the directing of acddent prevention could be based.

From the data collected in Nottingham, where the A & E attendance rate is similar to the national rates,' this would mean between one and two notifications per health viisitor per week. Similarly, for a health district with a population of 617 000, notification of 25 childhood acddents per day from the A & E department to health visitors in the community would be required each day, five days a week. Laidman recommended the employment of paediatric liaison health visitors in A & E departments to notify health visitors of acddents to children on thdr caseload.[12] Notifying 25 childhood acddents per day in a very large health district should not represent an unmanageable workload for the paediatric liaison health visitor or for the community health visitors in following up such acddents. Smaller health districts should find such notification even less of a problem. This small task is not resource intensive and has the potential to reduce repeated acddental injuries requiring admission. Health authorities should ensure through their purchasing plans and the contracting process that adequate information is provided by A & E departments to health visitors, otherwise they will be purchasing health visiting which fails to reach a group of children at high risk of acddental injury requiring hospital admission.

The role of general practitioners (GPs) and community pacdiatridans in acddent prevention has received less attention[13,14] than that of the health visitor, and little information exists on the effectiveness of interventions by these two groups of health care professionals.

Sibert has argued that, through child health surveillance, doctors have an opportunity to make the environment of children safer through environmental changes, and has drawn up a check list for action." Knowledge of which children are most at risk of future acddental injuries requiring admission would also allow GPs and community pacdiatridans to aim thdr acddent prevention work appropriately. Parent-held child health records would be an ideal vehicle for transmitting such information. They could also be used for collecting information on acddents which did not require medical attention and inddents which could have led to potentially serious injury but did not. This would help identify the sodal and environmental factors which predispose to childhood acddental injury," which is a crucial step in designing successful interventions.

Acknowledgements

I would like to thank Professors Richard Madeley and Clair Chilvcrs and Drs Richard Logan and Sarah Wilson for their advice, and Janice Gillard for typing this paper.

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Accepted on 9 September 1992

Role of the primary health care team in preventing accidents to children

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*SUMMARY. **Accidents** are the most common cause of mortality in children and account for considerable childhood morbidity. The identification of risk factors for childhood accidents suggests that many are predictable and therefore preventable. Numerous interventions have been found to be effective in reducing the morbidity and mortality from childhood accidents. The scope for accident prevention within the primary care setting **and** the roles of the members of the **primary** health care team are discussed. Finally, the problems associated with the team undertaking accident prevention work are explored and solutions suggested.*

Keywords: accidents; children and infants; preventive medicine; health professional's role; primary health care team.

Introduction

ACCIDENTAL injuries are the most common cause of death in children aged over one year, with approximately 700 children in England and Wales dying annually.[1] There are 120 000 admissions to hospital and two million attendances at accident and emergency departments following accidental injuries each year for children aged under 15 years in the United Kingdom.[2] For children under five years of age the majority of accidental injuries, both fatal and non-fatal, occur at home,[2] while for children aged five to 14 years, transport accidents are the most common fatal accident with pedestrian accidents accounting for approximately 60% of all road traffic accident fatalities in this age group.[2] Over recent years there has been increasing interest in the role of the primary health care team, or members of the team in preventing childhood accidents[3-10] and the choice of accidents as a key area for the 'health of the nation' is likely to lead to increasing pressure for the primary health care team to be involved in such work.[10] This paper discusses approaches to accident prevention and their effectiveness. It then concentrates on the role of the primary health care team in preventing accidents, the difficulties the team may face in undertaking such work and offers possible solutions.

Preventing accidental injuries

The term accident implies a chance or unpremeditated event, and suggests that people are powerless to prevent accidents. Epidemiological studies have, however, demonstrated that accidental injuries do not occur randomly and that they are predictable by the developmental stage of the child and by certain risk factors. Children aged under one year and five years and over have fewer accidents than children aged one to four years" "and boys have approximately one and a half times more accidents than girls.[1,2,14,15] Children are at increased risk of an accident if they are from economically deprived areas,[16-18] large families (three or more children)[12,14,19,20] or single parent families,[11] if they have teenage mothers[21] or conversely older mothers[22] or are from families experiencing recent stressful events.[23-25] Finally, children who have already had an accidental injury requiring medical attention arc at greater risk of future injuries than those children who have not.[13,14,20,26,27] Despite the identi-fication of these risk factors, so far, it has not been demonstrated that targeting accident prevention activities at children with multiple risk factors is effective in reducing injury rates.

Accident prevention activities can occur at three different levels. Primary prevention involves preventing an accident occurring, for example, the use of childproof containers; secondary prevention involves preventing an injury resulting from an accident, for example, wearing cycle helmets; and tertiary prevention involves preventing complications developing from an accidental injury, for example, giving first aid at the site of an injury. Activities can also be categorized as educational, engineering or enforcement approaches.[2] An educational approach would involve education of parents and children to change behaviour to reduce the risk of accidental injury, for example, educating parents about safety equipment. An engineering approach would involve an environmental change to reduce the risk of accidental injury, such as a traffic calming scheme. An enforcement approach would involve the use of regulations and legislation such as drink driving legislation or trading standards legislation.

In order for the primary health care team to undertake accident prevention, it needs to be aware of the effectiveness of different interventions. Those which have been found to be effective in reducing hazards, changing behaviour or reducing childhood accidental injury rates are detailed below. Interventions involving an environmental change or those which educate parents to change their environment seem to be the most effective.-"

- Infant and child car safety seats can reduce the incidence and severity of injuries to child passengers.[29-31]
- Car seat loan schemes,[32-34] legislation[35,36] and education can be effective in increasing the use of car child seats"
- Cycle helmet use can reduce the risk of head and brain injury.[38]
- Community based education campaigns can increase cycle helmet use."
- Urban redesign schemes involving the redistribution of traffic or the creation of pedestrian priority areas, or area-wide traffic calming schemes involving measures to limit the speed of traffic can be effective in reducing child pedestrian accidents.[40,41]
- Smoke detectors can reduce the mortality and morbidity from fires.*^
- Free smoke detectors can be installed in over 90% of homes and still be operational one year later in 88% of homes.[43]
- Education of parents can result in a reduction in hot water tap temperatures in the home.[44,45]
- Identification of hazards in the home by nurses can reduce the number of such hazards.[46]
- Face-to-face counselling by health professionals can increase the acquisition and use of safety equipment in the home.[46,47]
- The installation of window guards can reduce the incidence of falls from windows.'"

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Submitted: 28 April 1993; accepted: 24 August 1993.

- Childproof containers can be effective in reducing poisoning rates.*'
- Post-accident follow-up visits to parents by health visitors can reduce repeat accident rates.[50]
- Community intervention programmes based on local epidemiological data using educational and environmental approaches can be effective in reducing childhood accident rates.[51,52]
- Community first aid training schemes can reduce childhood accident injury rates.[53]

Role of the primary health care team

The first step in accident prevention for the primary health care team is for it to fully appreciate that accidental injuries are an important cause of mortality and morbidity. In order to do this, the team should collect data on accidental injuries in their practice population from general practitioner and practice nurse records and the local accident and emergency department. Prospective data collection may be easier than retrospective record searching for practice based data as previous work has suggested that details of accidents are often recorded inadequately.* The parent held child record, if adequately completed, may be a useful tool for collecting such information prospectively.[4,9,26] Health visitors can collect referrals from their paediatric liaison health visitor conceming accidental injuries to children attending hospital accident and emergency departments.' but care must be taken to ensure this data is complete as departments may not notify the health visitor of all attendances. Local school nurses can also be involved by collecting data on injuries occurring at school, and the local public health medicine department may be able to provide data on the use of secondary care services following accidental injury in the area. Collation of such information and the establishment of data collection systems could be undertaken by the practice administrative staff or the practice manager.

The collection of such data may in itself serve to raise awareness among the primary health care team. The data can also be presented to all team members to provide an overview of the nature and extent of the problem of accidental injuries. Similarly it could be used to raise awareness in the community by presenting It at displays in the health centre, publishing it in a public annual report, making it available to local schools or discussing it at postnatal, mother and toddler or women's groups.

Having collected the data the team needs to decide if accidental injuries arc one of its priorities for care. This may require the team to assess its current workload and priorities and re-direct resources, including time, to accident prevention at the expense of other areas of care. As members of the team are employed by different organizations, negotiations over priorities for care may also need to be held with the managers of attached staff.

The next step is for the team to assess its current practice, opportunities for prevention and training needs. Assessing current practice should involve examining not only current accident prevention work but also activities which may have some Impact on the risk of accidental injury, such as ensuring the health centre is safe for children, and restricting the prescription of drugs for self-limiting conditions or in large quantities at one time as these dmgs may be a potential source of accidental poisoning. As part of assessing opportunities for prevention, the team needs to examine its contacts with other agencies with a role in accident prevention, to develop existing relationships and to foster new contacts to ensure it develops communication channels with relevant agencies. If a local accident prevention group exists this may be the quickest way to make such contacts Alternatively, resources exist which describe the roles and responsibilities of the relevant agencies as well as how to contact them.[54] Health visitors have already identified their training needs,[3] and training resources have been produced,[5] parts of which would be suitable for use with the whole team.

Much of the awareness raising and educational accident prevention work the team can undertake can become part of their existing activities. Advice about home safety equipment appropriate to the development stage of the child and the local availability of equipment should form part of routine child health surveillance carried out by general practitioners and health visitors. Both of these professionals are in an ideal position to give advice about dangerous aspects of a child's home on an opportunistic basis when undertaking home visits and parents have been found to expect and welcome such advice.*' Lists of environmental hazards for health professionals to identify and discuss with parents on such occasions have already been produced.**-*' General practitioners and practice nurses also have the opportunity to undertake accident prevention work when a child presents with an acute injury. The circumstances surrounding the accident should be explored and possibilities for preventing future accidents discussed. Such injuries provide an opportunity to assess the parents' existing knowledge of first aid and to build on that knowledge. This can be reinforced by giving parents simple first aid leaflets as well as first aid charts to display in a prominent place at home, and information about local first aid courses. Health visitors can teach first aid at women's, postnatal or mother and toddler groups. In addition, any member of the primary health care team could train in first aid and then run first aid training sessions in the health centre.

Many health visitors already undertake post-accident follow-up visits to parents to discuss the circumstances of an accident and strategies for preventing future accidents.[3] In order to do this they need to be aware of all of the accidental injuries occurring to children on their caseload. In areas where there is no paediatric liaison health visitor or where the health visitor's information is in complete, general practitioners can pass on referral slips and letters from the accident and emergency department to the health visitor. Owing to the problems of distinguishing non-accidental from accidental injury and dealing with parental guilt following accidents, health visitors may feel more confident m undertaking follow-up visits if they receive specific training in this activity and have an opportunity to discuss the difficulties arising at such visits with colleagues. Training resources have already been produced for this purpose.*

The activities discussed so far have concentrated on raising awareness and education which are activities that health care workers are familiar with and possibly feel most comfortable with. As the available evidence on childhood accident prevention suggests that the most effective interventions are those that involve environmental change, the primary health care team may need to use other methods of accident prevention including empowerment and poUtical means. This is not a new idea: Julian Tudor Hart has eloquently discussed the role of the general practitioner in facilitating the community to act on its own behalf on community-wide causes of ill health.*' Such approaches may include providing the community with access to data on accidental injuries, teaching first aid courses, providing storage space m the health centre for safety equipment from loan schemes and becoming involved in a local accident prevention group which would plan accident prevention at a community level based on local needs. At a political level the team can identify hazards in the local community based on the accidental injuries which present to them, lobby policy makers at a local and national level and use the local media to apply pressure for environmental change.

Problems and possible solutions

There will be problems for the primary health care team in undertaking accident prevention work. Lack of resources, including time, has repeatedly been identified by health visitors as a factor limiting the amount and scope of their accident prevention work.'* This may be partly resolved at a local level by negotiations with service managers, but can only be properly addressed by detailing specific accident prevention activities in service contracts,[7] including contracts with fundholding practices, as there is growing concem that the public health role of the health visitor may be eroded in such situations.[59,60] Limited resources may also be a problem for other team members, but specifying clear roles for each member may result in activities being shared between team members.

Accident prevention is most likely to be successful if the primary health care team works as a team. Individual members will need a good knowledge of the roles of other team members and a clearly identified area of responsibility. Many primary health care teams do not function in this way; the team is often a structure rather than a way of working.*' Consequently, activities which require new ways of working may be perceived as too challenging and activities which are less important in terms of mortality and morbidity may be undertaken in preference to accident prevention. Educational opportunities for multidisciplinary training and team building*' or primary health care facilitators may be able to provide some of the support necessary to facilitate new methods of working.

Finally, there is still conflict in primary care between prevention and treatment. The role of the primary health care team is changing as prevention becomes increasingly important and evidence for the effectiveness of the team in preventing ill health mounts.*'"** The importance of prevention is alio recognized by the health promotion banding system in which remuneration is now linked to preventive work. The 'health of the nation' key area handbook on accidents suggests that specific accident prevention activities are the responsibility of primary care.'" in such a climate primary health care teams are likely to be increasingly encouraged to undertake such work.

Even though there will be difficulties, the time has come for the primary health care team to address the issue of accident prevention. In the words of the Irving report of the Royal College of Surgeons: 'Accidental injury is probably the most serious of all the major health problems in the developed countries yet it appears to be ignored by governments, populations and professionals alike".*' A recent study, however, is more optimistic, demonstrating that general practitioners believe they do have a role in child accident prevention and that many already undertake some accident prevention activities." Hopefully, in the future, increasing numbers of primary health care team members can be encouraged to have similar beliefs and to act upon them.

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HEALTH EDUCATION RESEARCH
Theory & Practice

Vol.10 no.3 1995
Pages 345-353

General practitioners: child accident prevention and 'The Health of the Nation'

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Abstract

It has recently been suggested in the 'Health of the Nation' that specific acddent prevention activities should be undertaken by general practitioners. This study reports the findings from a survey of general practitioners in Nottinghamshire assessing knowledge, attitudes and current practices in accident prevention. The findings suggest that more than two-thirds of responding general practitioners are aware of the extent of childhood mortality from accidental injuries and of the risk factors for accidental injury. Knowledge scores were higher for women, those aged 44 years and under, those on the child health surveillance list, those with experience of hospital or community paediatrics, and those with postgraduate qualifications in paediatrics. More than 50% of general practitioners hold positive views towards the activities suggested in the 'Health of the Nation' and more than 40% are already carrying out such activities. Positive attitudes are more commonly held in women and those on the child health surveillance list. There was a significant correlation between knowledge score and attitude score. For all accident prevention activities covered in the questionnaire, fewer practitioners imdertook an activity than held a positive attitude towards that activity. Accident prevention work is currently more likely to be undertaken by general practitioners on an opportunistic basis than on a systematic population basis. If general practitioner intervention is demonstrated to be effective, a shift towards a population approach may be more successful in reducing injury rates.

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Introduction

Above the age of 1, accidental injuries pose the greatest threat to a child's life throughout childhood (OCFS, 1993). The prevention of accidental injuries in children is increasingly being recognized as an important public health task and one in which the health service has a major role to play (CAPT, 1989; NAHA/RoSPA, 1990; DoH, 1993a). The choice of accidents as one of the key areas in the 'Health of the Nation' demonstrates this recognition (DoH. 1993a). The key area handbook on accidents emphasizes the role of the primary health care team and the individual members which make up the team by suggesting specific activities such as general practitioners giving advice on hazards in the home on home visits, giving child safety advice in routine child health surveillance consultations and giving advice on first aid (DoH, 1993a). The evidence for the effectiveness of such educational interventions is limited, with some studies demonstrating hazard reduction or changes in knowledge or attitudes, but reductions in injury frequency have not been consistently demonstrated (Towner *el at.*, 1993; Pless, 1993). There are, as yet, no studies demonstrating that safety education by general practitioners is effective.

Accident prevention is a subject which until recently had received relatively little attention in the primary care literature. Only one study so far has addressed the beliefs of general practitioners about their role in this type of work (Carter and Jones, 1993a). There is currently much debate about health promotion and disease prevention in primary care, focusing on the effectiveness of such interventions in a primary care setting and the benefits to be gained by the use of population based or high-risk group strategies (Rose, 1993; FHSG. 1994; ICRF, 1994; Mant, 1994). Previous studies of general practitioners' beliefs, attitudes towards and practices in health promotion and disease prevention suggest that many practitioners hold positive attitudes towards this area of work, believing it to be an important part of their work (Weschler *et al.*, 1983; Bruce and Burnett. 1991; Moser *et al.*, 1991; Calnan and Williams. 1993). Studies have also found that although positive attitudes are held, general practitioners also have concems regarding the effectiveness of health promotion and disease prevention in primary care (Bruce and Burnett, 1991; Moser *et al.* 1991; Calnan and Williams, 1993), their knowledge and competence to undertake such work (Weschler *et al.*. 1983; Wood *et al.*. 1989; Carter and Jones. 1993a), and the time and resources required (Weschler *et al.*. 1983; Bruce and Bumett. 1991; Carter and Jones, 1993a). This study theretore aims lo assess the knowledge, attitudes towards and practices in accident prevention of general practitioners, specifically including those activities suggested by the 'Health of the Nation' as appropriate for general practitioners to undertake.

Method

A questionnaire conceming knowledge of childhood accidental injury epidemiology, attitudes towards accident prevention and current practices in accident prevention was designed and piloted on a group of 20 general practitioner trainers and trainees. The questionnaire and stamped addressed envelope was mailed to all general practitioners in Nottinghamshire, using the Family Health Services Authority (FHSA) list as the sampling frame. Two further questionnaires were sent to non-responders.

The questionnaire consisted of four sections. The first consisted of attitudinal statements conceming accident prevention activities, including those suggested in the 'Health of the Nation' (DoH, 1993a). Possible responses ranged from strongly agree to strongly disagree on a five-point scale. The second section consisted of questions conceming current practice with responses ranging from always to never, with a not applicable category, again covering the activities suggested in the 'Health of the Nation' (DoH, 1993a). The knowledge questions were based on the Child Accident Prevention Tmst's 'Picture of Childhood Accidents' questionnaire, adapted for postal administration (CAPT, 1991) with the addition of questions conceming risk factors for childhood accidental injuries. The questionnaire has also been used to evaluate primary health care team accident prevention training sessions in which the questionnaire was used, hence the necessity to cover the same subject areas. The results of the evaluation of the training sessions will be presented elsewhere. The final section concemed personal and sociodemographic characteristics of the general practitioner and their practice, such as age, sex, qualifications, postgraduate experience in paediatrics or community paediatrics, whether the respondent had any children and their children's accidental injury histories. Practice details such as size and distance from the nearest accident and emergency department were also included. Surveys have also been undertaken with health visitors and practice nurses, using a similar questionnaire adapted for each professional group's role in childhood accident prevention, the results of which will be presented elsewhere.

The data were entered and analysed using the SPSS-PC statistical package. A knowledge score was computed by totalling all correct responses. An attitude score was computed by totalling all strongly agree or agree responses to positive statements and all strongly disagree or disagree responses to negative statements. Comparisons of categorical data have been made using χ^2 tests, comparisons of knowledge and altitude scores by personal and sociodemographic characteristics have been made using Mann – Whitney (/-tests and correlations between knowledge and attitude scores made using the Spearman *r* correlation coefficient.

Results

A total of 289 usable questionnaires were retumed by general practitioners giving a response rate of 59.3%. Of the 175 practices in Nottinghamshire, no questionnaires were retumed from 37 practices (21.1 %).These practices did not differ significantly (χ^2 tests for number of partners and training status. $P > 0.05$; Mann–Whitney (/-tests for deprivation scores, $P > 0.05$) from practices from which some or all general practitioners responded in terms of number of partners, training status or practice deprivation score (based on Jarman and Townsend scores).

Two-thirds of the respondents were male (195. 67.5%). Sixty four (22%) were aged under 35 years. 118 aged between 35 and 44 (41 %), 68 aged between 45 and 54 (24%), and 37 (13%) aiged 55 years and over Twenty six (9%) respondents practised in single-handed practices, 166 (57%) practised in group practices with between two and four partners. and 97 (34%) practised in group practices with five or more partners. Forty four (15%) respondents practised from premises up to 3 miles from the nearest accident and emergency department, 154 (53%) from premises between 4 and 10 miles. and 91 (32%) from premises more than 10 miles from the nearest accident and emergency department. Two hundred and twenty three (77%) respondents were on the FHSA child health surveillance list. 181 (63%) had worked in hospital paediatrics for at least 6 months since qualifying. 29 (10%) had worked in community paediatrics for at least 6 months and 44 (15%) hold a higher qualification in paediatrics (e.g. DCH, DCCH. MRCP Paeds). Two hundred and forty three (84%) general practitioners have children of their own (including stepchildren and adopted children). The children of 54% (131) of these general practitioners have attended an accident and emergency department following an accidental injury at some point during their life and the children of 9% (22) of these general practitioners have been admitted to hospital following an accidental injury.

Knowledge of accidental injury epidemiology

General practitioners' knowledge about accidental injury epidemiology in childhood is demonstrated in Table 1. More than two-thirds of general practitioners knew that accidental injury is the most common cause of death in children aged 1-4 years (/; = 209. 72.3%) and aged 5-16 years (n = 206. 71.3%): that most fatal accidents take place in the home under 1 year of age (n = 233, 80.6%); and correctly identified risk factors for accidental injury including young matemal age (n = 255, 88.2%), single parenthood {n = 248, 85.8%), previous accidental injury (n = 250, 86.5%), large family size (n = 235. 81.3%). socioeconomic deprivation (n = 262. 90.7%) and family stress (n = 245. 84.8%). The maximum knowledge score obtainable on the questionnaire is 23. The scores obtained by general practitioners ranged from 0 to 21, with the mean score being 11.3 (SD = 3.2) and the median and modal scores both being 12. Knowledge scores were significantly higher among female as compared to male general practitioners (Mann-Whitney U-test $Z = -2.1$. P = 0.04), among those aged 44 and under compared to those aged 45 and over (Mann–Whitney U-test Z = -2.1, P = 0.04), those on the child health surveillance list as compared to those not on the list (Mann–Whitney U test Z = -2.9. P = 0.004). those with experience in hospital paediatrics (Mann–Whitney (/-lest Z = -2.6. P = 0.008) and those with a higher qualification in paediatrics (Mann–Whitney (/-test Z = -2 I. P = 0.03) There was also a positive correlation between attitude score and knowledge score (Spearman rank correlation coefficient. r = 022. P = 0.001).

Attitudes towards accident prevention

Respondents' attitudes towards accident prevention are shown in Table II. It demonstrates that over two-thirds of general practitioners agreed or strongly agreed that most accidents are preventable (n = 227. 78.5%). but that only a minority (n = 74.

Table I. *General practitioners' knowledge of childhood accidental injury epidemiology*

Question	No. answering correctly (%)
What is the most common cause of death in children	
<1 year?	56 (19.4)
1-4 years?	209 (72.3)
5–16 years?	206(71.3)
What is the trend in child accident death rates in the UK over the last 20 years?	24 (8.3)
Which accident causes the most fatalities in children	
<1 year?	49 (17.0)
1-4 years?	53(18.3)
5–16 years?	142 (49.1)
What proportion of children attend an A&E depanment each year as a result of an accidental injury?	49 (17.0)
What percentage of children attending an A & E department following an accidental injury are admitted (o hospital?	102 (35.3)
Which home accident causes most A&E attendances in those children	
<1 year?	33 (11.4)
1–4 years?	51 (17.6)
5–16 years?	55 (19.0)
Where do most fatal accidents occur in children	
<1 year?	233 (80.6)
1–4 years?	67 (23.2)
5–16 years?	186 (64.4)
Do girls have more accidents than boys?	172 (59.5)
Which of the following are risk factors for childhood accidental injury?	
matemal age under 20 years	255 (88.2)
single parenthood	248 (85.8)
previous accidental injury	250 (86.5)
four or more children in family	235 (81.3)
socioeconomic depnvation	262 (90.7)
family stress	245 (84.8)

25.6%) believe they can be effective in preventing accidents. More than two-thirds of general practitioners believe accident prevention (n = 251. 86.9%) and first aid (n = 223, 77.2%) should be discussed in consultations for acute accidental injury; that concems regarding individual children at risk of injury should be reported to other members of the primary health care team (n = 259, 89.6%); that practices should display posters and leaflets (n = 206, 71.3%) and that il is appropriate for general practitioners to discuss accident prevention on home visits (n = 196, 67.8%). General practitioners were less likely to agree that practices should routinely collect data on childhood accidents (n = 79. 27.3%) or that they should lobby on local safety issues (n = 76, 26.3%). The maximum possible number of positive responses on the attitude score was 12. The scores for general practitioners ranged from 0 to 12. The mean score was 6.6 (SD = 2.4), the median number of positive responses was 7 and the modal number was 6. The attitude score was significantly higher among female than male general practitioners (Mann–Whitney (/-test Z = -2.39, P = 0.017) and among those on the FHSA child health surveillance list than those not on the list (Mann–Whitney (/-test Z = -2.78. P = 0.005). There were no differences between attitude scores by age. practice size, distance from nearest accident and emergency department, previous experience in hospital or community paediatrics, postgraduate paediatric qualifications, and experience of own

Table II. *General practitioners' attitudes towards childhood accident prevention*

Attitudinal statement	Agree or strongly agree (%)	Neutral (%)	Disagree or strongly disagree (%)
Most accidents are preventable	227 (78.5)	58 (20.1)	2 (0.7)
I believe GPs can be effective in preventing childhood accidents	74 (25.6)	143 (49.5)	69 (23.9)
Accident prevention is not a priority for me in child health care	51 (17.6)	111 (38.4)	124 (42.9)
Other members of the PHCT have a greater responsibility for accident prevention than the GP	103 (63.3)	72 (24.9)	30 (10.4)
Accident prevention should be discussed in child health surveillance consultations	169 (58.5)	95 (32.9)	21 (7.3)
Discussing accident prevention is important in a consultation for an accidental injury	251 (86.9)	23 (8.0)	13 (4.5)
It is not appropriate for GPs to mention accident prevention during home visits	38 (13.1)	52(18.0)	196 (67.8)
GPs should give first aid advice in consultations for acute accidental injury	223 (77.2)	43 (14.9)	19 (6.6)
Practices should routinely collect information on childhood accidents	79 (27.3)	96 (33.2)	112 (38.8)
GPs should be involved in lobbying or campaigning on local safety issues	76 (26.3)	118 (40.8)	93 (32.2)
It is important for practices to display posters and leaflets on accident prevention whenever possible	206 (71.3)	59 (20.4)	22 (7.6)
It is important for GPs to report concems about child safely in individual families to other members of the PHCT	259 (89.6)	25 (8.7)	3(1.0)

child attending or admitted to hospital following an accidental injury.

Current practice in accident prevention

Table III demonstrates current practices in accident prevention. The activities most commonly undertaken by general practitioners are displaying posters and leaflets on accident prevention (*n* = 177, 61.2%), reporting concems regarding child safety in individual cases to another member of the PHCT (*n* = 163, 56.4%), giving advice on first aid (*n* = 138, 47.8%) and discussing the prevention of future accidents during consultations for acute accidental injury (*n* = 136, 47.1%). The activities least often undertaken include giving advice about stockists of, or local loan schemes for. safety equipment (*n* = 7, 2.4%). working on a local child safety group (*n* = 8, 2.8%), lobbying or campaigning on a local safety issue (*n* = 8, 2.8%), giving leaflets about safety equipment (*n* = 13, 4.5%), and collecting and analysing data on childhood accidents (*n* = 17, 5.9%). General practitioners had made few contacts with other professional groups or child care workers about accident prevention over the preceding 2 years, with 67% (*n* = 192) having had contact with a maximum of two groups of workers. The two professional groups most commonly contacted by general practitioners were health visitors (*n* = 227, 79% had made contact with health visitors in the preceding 2 years) and other general practitioners (*n* = 118, 41% had made contact with other general practitioners in the preceding 2 years). Contacts outside the primary health care team occurred less frequently. Fewer than 5% of general practitioners had had contact with road safety officers, the Fire and Rescue Service, community development workers, health promotion officers, a local child safety group or a voluntary organization. There were no differences in current practice by personal or practice variables, except that doctors in practices of four or fewer partners more often gave safely leaflets when giving advice to parents.

For all activities more general practitioners agreed or strongly agreed that an activity should be undertaken, than actually undertook that activity.

Table III. *General practitioners' current practices in accident prevention*

Current practice	Always or often (%)	Sometimes (%)	Rarely or never (%)
How often, if ever, do you give advice about safety equipment in child health surveillance contacts?*	31 (10.7)	89 (30.8)	106 (36.7)
How often, if ever, do you give advice about first aid in consultations for accidental injury?	138 (47.8)	101 (34.9)	46 (15.9)
How often, if ever, do you discuss how future accidents can be prevented when you see a child following an accidenul injury?	136(47.1)	116 (40.1)	36(12.5)
How often, if ever, do you identify hazards in the home on home visits and discuss them with parents?	38 (13.1)	107 (37.0)	141 (48.8)
If you give advice about safety equipment, how often, if ever, do you give advice about local stockists or local loan schemes?	7 (2.4)	28 (9.7)	250 (86.5)
When you consider a child to be at risk of accidental injuiy, how often, if ever, do you report your concems to another member of the PHCTT?	163 (56.4)	76 (26.3)	44(15.2)
If you give advice about safety to parents, how often, if ever, do you also give parents a safety leaflet?	13 (4.5)	25 (8.7)	246 (85.1)
	Yes	**No**	**Don't know**
The practice has analysed data on childrens' accidents presenting to the PHCTT in the last 2 years	17 (5.9)	250 (86.5)	22 (7.6)
Data on accidents to children have been included in one of our practice annual reports in the last 2 years	8 (2.8)	240 (83.0)	40(13.8)
1 have worked with a local child safety group within the last 2 years	8 (2.8)	277 (95.8)	4 (2.1)
I have lobbied or campaigned on a local safety issue as an individual within the last 2 years	8 (2.8)	275 (95.2)	6 (2.1)
I have attended a course or lecture on child accident prevention in the last 2 years	45 (15.6)	238(82.4)	5 (1.7)
Posters on child safety have been displayed in our waiting room within the last 2 years	177 (61 2)	56 (19.4)	55 (19.0)

'Some general practitioners do not provide child health surveillance, consequently the percentages do not add up to 100 as this group has been excluded from the table.

Only 9% of those stating that general practitioners should be involved in lobbying or campaigning had done so in the preceding 2 years. Fourteen per cent of those who felt it was appropriate to discuss accident prevention on home visits always or often did so. and the same percentage who felt practices should routinely collect information on childhood accidents had actually done so. Sixteen per cent of those believing that they should discuss accident prevention in child health surveillance consultations always or often did this. More than 50% of those agreeing that accident prevention or first aid should be discussed in acute injury consultations (51 and 57%, respectively) always or often undertook that activity. Sixty per cent of those agreeing that it was important to report concems about child safety to other members of the team always or often did so. Finally. 68% of those believing it was important for practices to display posters and leaflets stated that their practices had done so in the preceding 2 years.

Discussion

This study has demonstrated that more than two-thirds of general practitioners are aware that accidents are the major threat to a child's life over the age of 1 year and are able to identify the risk factors for childhood accidental injury. More than 50% of general practitioners hold positive attitudes towards the activities suggested as being part of their role in the 'Health of the Nation' (DoH, 1993a) and more than 40% are undertaking these activities on a regular basis.

There are some methodological issues to consider before discussing the results in more detail. Although a response rate of 59.3% is reasonable for a postal questionnaire survey, it does raise questions about the representativeness of the respondents. Responses were received from 138 practices in Nottinghamshire, which represents 79% of all practices. Details of the personal characteristics of non-responding general practitioners are not available, consequently it is not possible to assess whether such characteristics differed between responders and non-responders. As with all surveys, it is likely that those most interested in the subject matter of the survey responded. Consequently the results probably represent the most positive attitudes towards and practices in accident prevention, and possibly those with the most knowledge in accident prevention. This must be home in mind when interpreting the results, as they are probably not generalizable to all general practitioners. The information on current practice in accident prevention should probably be viewed with some caution and as representing maximum activity. as reported practice may overestimate actual practice.

As a subject the role of the general practitioner in accident prevention has received some attention in the primary care literature in recent years. It has been suggested that general practitioners could be involved in the collection of accident statistics at the practice level, liaising with health visitors regarding children identified as being at risk, offering age-specific safety advice. identifying hazards in the home, and giving first aid and accident prevention advice at consultations for acute accidental injury (Greig. 1987; Agass *et al.*. 1990; Carter and Jones, I993a.b: Kendrick. 1994). Even if it was assumed that all non-responding general practitioners in Nottinghamshire held negative views towards all aspects of accident prevention covered in the questionnaire, the results would still be encouraging. More than half of all general practitioners in Nottinghamshire would consider it important to report concems about child safety in individual cases to another member of the PHCT and to discuss accident prevention in a consultation for an acute accidental injury. More than 40% would believe that most accidents are preventable, that they should give first aid advice in acute injury consultations, that it is important for practices to display leaflets and posters and that it is appropriate for them to discuss accident prevention on home visits. This suggests there is considerable potential for involving general practitioners in undertaking accident prevention work in primary care.

The differences in attitude score by sex and inclusion on the child health surveillance list are interesting. Many of the studies of attitudes towards health promotion and disease prevention have not analysed the results in terms of sex of respondent, but one study has found that female practitioners were more likely to hold positive attitudes towards health promotion and disease prevention (Wood *el al.*, 1989). The previous primary care study on accident prevention did not find any difference in attitude or practice by either of these variables (Carter and Jones, 1993a). However the number of practitioners in each of these groups is not provided in the study, so it is possible that the study had insufficient power to detect such differences.

It is interesting that only one quarter of general practitioners believed that they could be effective in accident prevention. The activity most commonly undertaken by general practitioners is displaying posters and leaflets, and although more than 70% of patients will read posters displayed in the waiting room (Ward and Hawthorne. 1994), their effectiveness has yet to be demonstrated. Consequently, based on current activity, the perception of general practitioners that they are not effective in accident prevention. may be accurate. It may also reflect the finding from previous studies that many doctors are concemed about the effectiveness of their preventive work (Weschler *et al.*. 1983: Bmce and Bumett, 1991; Moser *et al.*. 1991) However, more than one quarter of general practitioners agreed that certain activities were part of their role in accident prevention. This suggests that the effectiveness of an intervention is not necessarily a prerequisite to the belief that an intervention should be undertaken in primary care. This may reflect the reality of primary care, where the effectiveness of the many treatments used remains to be demonstrated in a general practice population (DoH. 1993b), including general practitioner accident prevention activities (Pless, 1993; Towner and DowsweU, 1993).

Comparisons between attitudes towards certain accident prevention activities, and current practices reported by general practitioners demonstrate some inconsistency between attitudes and practices, as has been previously found (Carter and Jones, 1993a). The reasons for not undertaking activities were not explored in this study, but previous work suggests that lack of time is frequently given as a reason, both for accident prevention work and for preventive work generally (Weschler *et al.,* 1983; Bruce and Bumett. 1991; Carter and Jones, 1993a). A further possibility is a lack of confidence or skills in undertaking such work. This area has not been studied in accident prevention. but general practitioners have previously been found to perceive that they lack competence to advise on certain aspects of lifestyle (Weschler *et al.,* 1983; Wood *et al..* 1989). Considerable communication skills would be required to undertake some of the activities covered in the questionnaire. For example, discussing the prevention of future accidents during a consultation for acute accidental injury may not be easy for a variety of reasons such as having to consider parental guilt. parental fears that the general practitioner may suspect non-accidental injury and a desire not to adopt a victim blaming approach with the family. Such potentially difficult consultations may be undertaken less often than activities which are perceived to be easier. such as displaying posters or leaflets The difficulties of undertaking such contacts in health visiting have already been recognized (Laidman. 1987) and resources designed to meet training needs in this area (CAPT. 1991). As yet the accident prevention training needs of general practitioners have not been identified. although both this study and previous work demonstrate that few have attended courses or lectures on the subject (Carter and Jones, 1993a). It has previously been found that general practitioners lack background information on the subject of accident prevention (Carter and Jones, 1993a), although this has not been explored in any more detail and the term background information has not been defined. The results from this study suggest that general practitioners do have some knowledge of accidental injury epidemiology, although knowledge of approaches to accident prevention was not assessed. As yet no studies have addressed the issue of confidence in. or perceived competence at, undertaking accident prevention work among general practitioners.

Although many general practitioners are undertaking some accident prevention activities. these are more likely to occur on an opportunistic basis than on a routine basis. For example, almost four times as many general practitioners always or often give advice on preventing accidents or on first aid in a consultation for acute accidental injury than in routine child health surveillance contacts or on home visits. This suggests that general practitioners may be using a high-risk group approach to accident prevention activities rather than a population approach. Such an approach may not achieve the greatest reductions in injury frequency. because although some children are at great risk of accidental injury, in total their numbers are small when compared with the large number of children at lesser risk, and the majority of injuries will occur in this large group of children at low risk. This point is often made in relation to the prevention of other diseases (Rose. 1993: Mant. 1994). but seems rarely to appear in the literature on accident prevention, despite the same principles applying (Bijur *et al.,* 1988). If general practitioner accident prevention interventions are found to be effective in reducing injury morbidity and mortality. a move towards a systematic population approach. and away from opportunistic activities aimed at high-nsk children, may be required. However. as in coronary heart disease prevention. the issue of the effectiveness of prevention in those at differing levels of risk may bring into question the use of the population approach (FHSG. 1994: ICRF.

1993). This issue, so far, remains to be addressed in accident prevention.

In conclusion, this study suggests that at least 50% of general practitioners hold positive attitudes towards the accident prevention activities suggested as being appropriate for general practitioners in the 'Health of the Nation' key area handbook. Although fewer practitioners undertake activities than hold positive views towards those activities, more than two-fifths are currently undertaking those activities suggested in the 'Health of the Nation'. Such activities are most commonly undertaken on an opportunistic basis. The most important question which remains to be answered is whether such general practitioner intervention can be demonstrated to be effective in reducing injury morbidity and mortality.

Acknowledgements

We would like to thank the general practitioners for completing the questionnaire. We would also like to thank the Child Accident Prevention Tmst for permission to adapt and use their questionnaire 'The Picture of Childhood Accidents'. This research was funded by the Department of Health.

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Received on October 10. 1994; accepted on February 2. 1995

How do practice nurses see their role in childhood injury prevention?

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Abstract

***Objectives*—To assess the knowledge of unintentional injury epidemiology, the attitudes towards, and current practices in injury prevention among practice nurses.**

***Setting*—Practice nurses employed by general practitioners in Nottinghamshire, United Kingdom.**

***Method*—A postal questionnaire was sent to all practice nurses on the Family Health Services Authority list (n = 322) with questions covering sociodemographic details, occupational details, unintentional injury epidemiology, attitudes towards the injury prevention activities suggested by a government report as part of the role of the primary health care team, and current practices in injury prevention.**

***Results*—A response rate of 71·1% was achieved. More than 50% knew that unintentional injuries were the most common cause of death in childhood. A similar per cent knew the site of most fatal injuries in the under 1 and 5-16 year age groups. More than two thirds correctly identified a range of risk factors for unintentional injury. However, only two fifths of nurses believed they could be effective in preventing injuries. There were considerable gaps between attitudes and practice for most activities. The activities most commonly undertaken include displaying posters and leaflets (69·4%), giving advice on prevention (51·1%), and advice on first aid (45·0%) during injury consultations.**

***Conclusions*—Most practice nurses hold positive attitudes towards injury prevention activities, but fewer undertake these activities regularly. The activities most commonly undertaken employ an educational model. Further research is needed on the barriers to practice nurses undertaking more injury prevention work, the effectiveness of systems to overcome such barriers, and the effectiveness of these injury prevention activities.**

(*Injury Prevention* 1995; 1: 159–163)

Keywords: practice nurses, primary health care.

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In 1984 the Royal College of Nursing defined the role of the practice nurse as 'a registered general nurse who is employed by a general practitioner to work within the treatment room and is a member of a team responsible for the clinical nursing care of the practice population together with the district nursing team of the health authority'.' The role of the practice nurse has expanded over the last 10 years, and it now involves a wide range of activities including providing treatments, immunisations, screening, investigative procedures, and health promotion.[2-10] The inclusion of health promotion as a contractual requirement in the 1990 general practitioner contract facilitated the development of nurse led health promotion activities in primary care," and has been partly responsible for a rapid expansion in the niunber of practice nurses employed by general practitioners.[10]

The role of these nurses in childhood injury prevention in the United Kingdom has, so far, received little attention. The government's health strategy, the *Health of the Nation* suggests that the primary health care team should be involved in injury prevention by undertaking a range of activities. These include the collection of data, the provision of safety advice to individuals and communities, participation in safety equipment loan schemes, checking homes for hazards, advice regarding disposal of unwanted medicines, giving advice on first aid, and membership of local healthy alliances." However, no mention is made of the specific part practice nurses are expected to play. Few of the published studies addressing the role of the practice nurse[2-10] have discussed injury prevention. Those that have confined themselves to first aid for injuries[4 5 8 9] or assisting at resuscitation.' The majority of these studies have highlighted the training needs of practice nurses, but again, none have discussed these needs in terms of injury prevention.[2-4 6 8 10]

Practice nurses have previously been found to hold a diverse range of views conceming health promotion. The majority favour an educational model (promoting an understanding of health issues to enable the patient to make an informed choice) or a behavioural change model (encouraging people to change to healthier lifestyles), in preference to a social change model (working to change political and social environments to make healthier choices easier choices).* In practice, however, most nurses adhere to a narrow medical model (promoting medical intervention through persuasive methods, screening, vaccination, etc). This may not, however, be the most effective model for injury prevention, where issues of social inequality and poverty often need to be addressed.[12 13]

The opportunities that practice nursing provides for injury prevention are great." Many nurses deal with minor injuries in the surgery*") and could offer advice on first aid or prevention at these consultations, as well as collecting and analysing data on the injuries that present to them. Similarly, many nurses do immunisations[4-6 10] and could offer injury prevention advice appropriate to the developmental stage of the child, while nurses who make home visits*"" could identify hazards in the home. All are members of their communities and could be involved in lobbying or campaigning on local safety issues.'* This study therefore aims to assess the knowledge of practice nurses of childhood unintentional injury epidemiology, their attitudes towards, and their current practices, in injury prevention.

Methods

A questionnaire conceming injury prevention was designed and piloted on a group of 10 practice nurses. The questionnaire and stamped addressed envelope was mailed to all practice nurses in Nottinghamshire (n = 322), using the Family Health Services Authority list as the sampling frame. Two further questionnaires were sent to non-responders.

The questionnaire included four sections. The first consisted of attitudinal statements conceming injury prevention activities, including those suggested in the *Health of the Nation* for the primary health care team." Possible responses ranged from strongly agree to strongly disagree on a five point Likert scale. The reliability of the attitudinal section of the questionnaire has been assessed by calculating correlation coefiicients between each attitudinal statement and the total score (excluding the score for that attitudinal statement) and by calculating Cronbach's alpha coefficient." The second section consisted of questions conceming current practice with responses ranging from always to never, with a not applicable category, again covering the activities suggested in the *Health of the Nation."* Content validity for the attitudinal and current practice sections was established by obtaining the views of practice nurses belonging to a local practice nurse educational group and by ensuring that all pertinent activities were covered. The knowledge questions consisted of questions covering the subject matter included in the Child Accident Prevention Trust's (CAPT) 'picture of childhood accidents' questiormaire." Additional questions concerning risk factors and the type of accident most commonly requiring accident and emergency department attendance were added. This questionnaire was originally developed by the CAPT as an educational tool to be used when training for health visitors. It was adapted for postal use, and again content validity was established from the views of practice nurses, as above. The validity of the questionnaire in measuring knowledge was assessed by using it with 58 members of primary health care teams before, and between two and four months after, accident prevention training during which information covering each of the knowledge questions was provided. The correct answers to the knowledge questions were obtained from the information sheet provided by the CAPT." In addition, information was also obtained from the Office of Population Censuses and Surveys mortality statistics" and from the Home Accident Surveillance System." " The final section concemed personal and sociodemographic characteristics of age, sex, qualifications, experience in health visiting, paediatric or school nursing, whether the respondent had any children, and their children's injury histories.

The data were entered and analysed using the SPSS-PC statistical package. The knowledge score was computed by totalling all correct responses. The attitude score was computed by totalling all strongly agree or agree responses to positive statements, and all strongly disagree or disagree responses to negative statements. Comparisons of categorical data were made using χ^2 tests; comparisons of knowledge and attitude scores by personal and sociodemographic characteristics were made using Mann-Whitney U tests; and correlations between knowledge and attitude scores used the Spearman rank correlation coefficient.

Results

Altogether 229 usable questionnaires were retumed — a response rate of 71·1 %. The age and number of years as a practice nurse are shown in table 1. Only 4% (nine) were qualified children's nurses, 8% (19) had worked as a school nurse for six months or more, and 2% (four) were qualified as health visitors. Eighty seven per cent (198) had children. The children of 57% (113) of the practice nurses who were parents had attended an accident and emergency department after an injury and 14% (28) had been admitted to hospital after an injury.

KNOWLEDGE OF UNINTENTIONAL INJURY EPIDEMIOLOGY

A significant increase in knowledge score was demonstrated in the group of primary health care team members undergoing training. The mean score increased significantly for each professional group following training. (Wilcoxon matched pairs test, general practitioners, p = 0·003; health visitors, p = 0O02; and practice nurses, p = 0006). This suggests the knowledge section of the questiormaire was a

Table I Age and length of employment as a practice nurse

Age (years)	No (%)	Years in practice nursing	No (%)
<35	66 (28·8)	<5	159 (69·4)
35-44	89 (38·9)	5-10	54 (23-6)
45-54	65 (28·4)	11-15	7(3·1)
55-64	9 (3·9)	15-20	8 (3·5)
⩾65	0	>20	1 (0·4)
Total	229 (100)	Total	229 (100)

valid instrument for measuring knowledge of unintentional injury epidemiology.

Table 2 demonstrates the epidemiological knowledge of practice nurses. More than half were aware that injuries are the most common cause of death over the age of 1 year (65·5% of responding nurses correctly identified injuries as the most common cause of death for the 1-4 year age group and 60·3% for the 5–16 years age group, respectively). Similarly, more than half were aware that most fatal injuries take place in the home for those under 1 year (79·9% responded correctly), whereas transport injuries are the most common fatal injur between 5 and 16 years (56·8% respondei correctly). More than two thirds identified th following risk faaors for injury: young mater nal age (72·5%), large family size (67·2%) socioeconomic deprivation (82·1%), anc family stress (88·6%). The maximum knowledge score obtainable on the questionnaire is 23; the actual scores obtained ranged from 0 tc 18 (mean 10·7). Those with children, and those with experience of school nursing, had significantiy higher knowledge scores (Mann-Whitney U test Z = -2·0, p = 0·04; Z = –2·4, p = 0·02 respectively). No other associations were found between knowledge and personal characteristics of the nurses, including having a child who had had an injury.

ATTITUDES TOWARDS INJURY PREVENTION

Highly significant correlations were obtained between each attitudinal statement and the total attitude score, with correlation coefficients ranging from 0·26 to 0·61 (p = 0·001 for all correlation coefficients). Intemal consistency was assessed by Cronbach's alpha coefficient, which was 0·61.

The attitudes of practice nurses towards injury prevention are shown in table 3. Certain activities are regarded positively with the majority agreeing that most injuries are preventable (88·7%), that prevention should be discussed in child health surveillance consultations (80·0%), that they should give first aid advice (72-5%), that injury prevention should be discussed in conultations for acute injury (82·1%), and that practices should display posters or leaflets on the subject (89·5%). By comparison, relatively few believed they could actually be effective in preventing injuries (46·3%) or that they should be involved in lobbying or campaigning on local safety issues (27·1%).

The maximum possible number of positive responses on the attitude score was 10 and scores ranged from 0 to 10, with a mean of 6·2. There were no significant associations between personal characteristics and attitude score, nor was there a correlation between knowledge and attitude scores (r = 0·09, p > 0·05).

CURRENT PRACTICE IN INJURY PREVENTION

The injury prevention activities are shown in table 4. The activities most commonly undertaken are displaying posters and leaflets (69-4%), discussing prevention of future injury in a consultation for acute injury (51·1%), and giving advice on first aid in acute injury consultations (45·0%). The activities least likely to be undertaken include working with a local child safety group (only 1·3% had done so in preceding two years), and lobbying or campaigning (1·7%). Few (6·6%) practice nurses had attended a course or lecture on child injury prevention in the preceding two years.

Twenty five per cent had not had contact with any other child care workers or health professionals about child safety in the preceding two years. Of those who had had such contacts, these were most often made within the primary health care team, with

Table 2 Practice nurses' knowledge of childhood unintentional injury epidemiology with correct answers in parentheses (ages in years)

Question	No (%) answering correctly
What is the most common cause of death in children?	
<1 (SIDS)	67 (29·3)
1–4 (acddents)	150 (65·5)
5-16 (acddents)	138 (60·3)
What is the trend in child accident death rates in the UK over the last 20 years? (falling)	16 (7·0)
Which is the most common fatal accident in children?	
< 1 (suffocation)	70 (30·6)
1-4 (transport)	24 (to·5)
5-16 (transport)	101 (44·1)
What proportion of children attend an A & E department each year as a result of an acddental injury? (1 in 6)	46 (20-1)
What percentage of the children anending an A & E department following an acddental injury are admitted to hospital? (5–10%)	68 (29·7)
Which home acddent causes most A & E attendances?	
<1 (fall)	23 (10·0)
1–4 (fall)	28(12·2)
5–16 (fall)	42(18·3)
Where do most fatal accidents occur in children?	
< 1 (home)	183 (79·9)
1-4 (on the road)	147 (64·2)
5–16 (oo the road	130 (56·8)
Do girls have more acddents that boys? (fewer)	91 (39-7)
Which of the foUowing arc risk factors for childhood acddental injury?	
Matemal age under 20 years (risk factor)	166 (72-5)
Single parenthood (risk factor)	151 (65·9)
Previous accidental injury (risk faaor)	149 (65·1)
≥ 4 children in family (risk factor)	154 (67-2)
Socioeconomic deprivation (risk faaor)	188 (82-1)
Family stress (risk factor)	203 (88-6)

SIDS = sudden infant death syndrome; A&E = accident and emergency.

Table 3 Practice nurses' attitudes towards childhood injury prevention

Attitudinal statement	Agree or strongly agree (%)	Neutral (%)	Disagree or strongly disagree (%)
Most acddents are preventable (n = 228)	203 (88·7)	25 (10·9)	0
I believe practice nurses can be effective in preventing childhood acddents (n = 227)	106 (46·3)	100 (43·7)	21 (9·2)
Acddent prevention is not a priority for me in child health care (n = 228)	34 (14·8)	62(27·1)	132(57·7)
Other members of the PHCT have a greater responsibility for accident prevention than the practice nurse (n = 226)	95(41·5)	52 (27·1)	69 (30·1)
Acddent prevention should be discussed in child health surveillance consultations (n = 225)	183 (800)	31 (13·5)	11(4·8)
Discussing accident prevention is important in a consultation for an acute acddental injury (n-228)	188 (82·t)	24(10-5)	16 (7·0)
Practice nurses should give first aid advice in consultations for acute acddental injury (n = 226)	166 (72·5)	45 (19·7)	15 (6·5)
Piactice nurses should routinely collect information on childhood accidents (n - 228)	104 (45·5)	96 (41·9)	28(12·2)
Practice nurses should be involved in lobbying or campaigning on local safety issues (n-228)	62(27·1)	119 (52·0)	47 (20·5)
It is important for practices to display posters and leaflets on accident prevention whenever possible (n = 228)	205 (89·5)	19 (8·3)	4 (1·7)

PHCT - primary health care (earn

67·7% of practice nurses having contact with a health visitor, and 62·9% with a general practitioner concerning child safety in the preceding two years.

There were discrepencies between attitudes and practices for all activities. Of those agreeing in principle to the importance of various activities only 73% display leaflets and posters, 54% discuss injury prevention or first aid in consultations for acute injury, and only 5% lobby on local safety issues.

Discussion

The social and occupational characteristics of the nurses responding to this survey are similar to those responding to previous surveys.[3 4 6 7 10] As has been previously demonstrated, a large proportion (70%) entered practice nursing in the preceding five years,[4 6 7 10] few are qualified health visitors,[3 7 10] and few have experience of school nursing. As regards injury prevention, although epidemiological knowledge is incomplete, more than half of the nurses correctly answered questions on most common cause of death above the age of 1 year, the site of most fatal injuries, and correctly identified the risk factors. Attitudes towards injury prevention activities were not uniformly positive, however, with less than one half believing they could be effective, despite almost 90% believing most injuries were preventable. There were also large discrepancies between the number of nurses holding positive attitudes towards injury prevention activities and the proportion undertaking these activities in practice.

The response rate in this study was high, and compares favourably with other surveys of practice nurses.[3 6 7 10] However, those responding are possibly those most interested in the subject and hence those most likely to have greater knowledge, more positive attitudes, and undertake more prevention activities. Caution should therefore be exercised in extrapolating these results to any wider population of nurses. Also, self reports of preventive activity by primary care physicians tend to overestimate activity when compared with medical record audits or patient surveys.[20] It is likely that this phenomenon also applies to practice nurses. Consequently even the relatively low level of activity reported in this study may be an overestimate.

It is nevertheless interesting and encouraging that, despite the lack of a clearly identified role for practice nurses in injury prevention, more than two thirds held positive attitudes towards some prevention activities, and that more than 50% were currently undertaking some such activities. The gap between attitudes and practice suggests there are barriers to imdertaking injury prevention activities in routine practice. While more knowledge and skills in this area may be required, other constraints may also be operating. Previous work suggests that the reasons most commonly given by practice nurses for such limitations include lack of training, lack of time, the general practitioner's attitudes, and lack of confidence.[7] Although none of these studies specifically concemed injury prevention, similar barriers are likely to apply in this area. Most practice nurses in this study do not believe that they can be effective in preventing children's injuries. The belief that a practitioner holds regarding their effectiveness in a particular situation is likely to determine activity in that situation.[21-23] Consequently, unless practice nurses believe they can be effective they are unlikely to undertake injury prevention activities. Methods for increasing belief in self efficacy have been identified. These include providing opportunities for personal accomplishment, providing vicarious experience of accomplishment, verbal persuasion, and reducing anxiety associated with feelings of failure.[22] Addressing these areas in training programmes specific to injury prevention may increase the nurses' sense of self efficacy and thus their involvement in injury prevention activities.

Other barriers to undertaking preventive activity in a primary care setting have also been identified.[24-26] Activities aimed at improving the health of the population may not be seen by clinicians as relevant to their role with individual patients. Expressing the benefits of preventive activity in terms of individual patients or practice populations may, therefore, be more relevant to clinicians.[24] Also, primary care clinicians traditionally have a reactive role, responding to patients complaints, rather than being proactive. Reminders to undertake a preventive activity may facilitate a more proactive role,[24 26] as may the contractual emphasis on health promotion in primary care. However, in primary care, acute problems take precedence over non-acute problems, and even if preventive services are prioritised, this will likely continue.[24] Preventive services, by their nature, fail to provide positive feedback for the practitioner; one is rarely aware of an event that has been prevented. At the practice level it is unlikely that injury prevention programmes will be accompanied by a noticeable reduction in injuries due to the relatively small numbers. Aggregating practice data may be a solution to this problem; alternatively process measures could be used to provide feedback.[26] The implementation of formal systems for providing preventive services increases preventive

Table 4 Practice nurses' current practices in injury prevention

Current practice	*Always or often (%)*	*Sometimes (%)*	*Rarely or never (%)*
How often, if ever, do you give advice about safety equipment in child health survdllance contacts? (n = 205)	28 (12·2)	84 (36·7)	93 (40·6)
How often, if ever, do you give advice about first aid in consultations for acute acddental injury? (n = 227)	103 (45·0)	82 (35·8)	32 (14·0)
How often, if ever, do you discuss how future acddents can be prevented when you see a child following an acute acddental injury? (n = 214)	117 (51·1)	56 (24·5)	41 (17·9)
How often, if ever, when advising about safety equipment, do you give details of local stockists or local equipment loan schemes? (n = 200)	13 (5·6)	40 (17·5)	147 (64·2)
If you give advice about safety, how often, if ever, do you also give parents a safety leaflet? (n = 200)	16 (11·4)	41 (17·9)	143 (62·4)

activity.[24] Although these evaluations do not include injury prevention programmes it is likely that the same principles will apply.

The finding that attitudes were most likely to be positive towards activities based on an educational model and that these are the activities most commonly undertaken, while activities such as lobbying or campaigning on safety issues are rarely imdertaken, confirms previous work that practice nurses' use of 'radical' approaches to health promotion, such as the social change model, is limited.' As the environmental approach to injury prevention has been demonstrated to be more effective than the educational approach,[27-29] training covering other possible approaches,'" their relative effectiveness, and how to use them in everyday practice may be useful for these nurses.

The lack of an association between knowledge and attitude scores is interesting, as knowledge is thought to influence attitudes.[21] The same questionnaire has been used on general practitioners and health visitors and for both groups a significant correlation between knowledge and attitude score was obtained (results presented elsewhere[31 32]). However, both these professional groups had higher knowledge scores than the practice nurses. It is therefore possible that the relationship between knowledge and attitudes is not a simple linear one, and that there is a threshold above which knowledge and attitude scores correlate. However, the numbers of practice nurses with high knowledge scores in this study were too small to investigate this hypothesis further.

Conclusion

The role of the practice nurse should not be viewed in isolation but rather as part of all the injury prevention activities of the primary health care team.'* Members of the team may have differing areas of expertise, differing interests, and differing opportunities to undertake such activities. These factors may change over time and with changes in the composition of the team. Therefore, it is important that members are aware of each other's roles, that they adapt to changing circumstances, and that each team defines the roles of its members based on the needs of the practice population, as well as being based on the expertise, opportunities, and interests of the team members.[24] This study suggests that at least some practice nurses are interested in injury prevention and are willing to undertake activities in this area. Whether they should do so remains to be answered, and until more information is available on their effectiveness in this area, the question will remain open for debate.

We would like to thank the practice nurses in Nottinghamshire for completing the questionnaire. We arc also grateful to the Child Accident Prevention Trust for permission to adapt and use their 'picture of childhood accidents' questionnaire. This study was funded by the Department of Health.

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Journal of Public Health Medicine
Vol. 17. No. 2. pp 193-199
Printed in Great Britain

Health visitors' knowledge, attitudes and practices in childhood accident prevention

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Abstract

Background The importance ol the health visitor's role in childhood accident prevention has long been recognized. although previous work suggests that many health visitors are unsure of that role. feel inadequately prepared (or it and recognize significant constraints on their accident prevention activity. The *Healih of the nation* suggested that specific accident prevention activities should be undertaken by health visitors. This study aims to assess whether those activities are currently pan of routine health visiting practice. as well as Ihe attitudes towards accident preveniion and knowledge of childhood accidental injury epidemiology.

Method A postal questionnaire survey covering knowledge. attitudes and practices in accident prevention as well as personal characteristics was sent to all health visitors in Nottinghamshire. using the community unit trusts' list of employees as the sampling frame.

Results A response rale ol 88·5 per cent was obtained. The majority of health visitors were aware that accidental injuries are the most common causa of death in childhood above the age of one year. The majority of health visitors were also aware of the types of accident most likely to be fatal. and aware of the risk factors for childhood accidental injuries. Many health visitors held positive anitudes towards all accident prevention activities covered in the questionnaire. There was a positive correlation between attitude and knowledge scores ($p < 0{\cdot}01$). There were some discrepancies between attitudes and current practices. particularly in the areas of teaching first aid to parents' groups and lobbying or campaigning on local safety issues.

Conclusions Although many health visitors hold positive attitudes towards. and currently undertake many of the accident prevention activities suggested in the *Health of the nation,* there are areas where practice could be improved. such as giving advice about stockists of safety equipment including local loan schemes, undertaking first aid sessions in parents' groups and lobbying or campaigning on local safety issues.

Introduction

The mortality rate in England and Wales for accidental injuries is higher than for any other cause of death in childhood over the age of one year.' Acddental injuries also place a large burden on the health service in terms of accident and emergency (A & E) department attendances and hospital admissions, estimated as over 2 million and 120 000 each year respectively, in the United Kingdom.[2,3] It has been estimated that they cost the health service £200 million annually, an estimate that does not take into account the large social costs of children's accidents or the costs of long-term care of children disabled by accidents.[4] The role of the health service in the prevention of childhood accidents has received increasing attention over recent years,[5] most notably in the choice of accidents as one of the key areas in the *Health of the nation.*[6]

Health visitors have traditionally been regarded as having an important role in the prevention of children's accidents because of their frequent contact with children and their parents, both as individuals and in groups, their access to families' homes, their understanding of child development'"' and their opportunities, more recently, for identifying the needs of their client population and developing strategies to meet those needs."'" The key area handbook[6] on accidents emphasizes the role of health visitors in acddent prevention, suggesting they should undertake activities such as checking the home for hazards on home visits, using protocols which include acddent prevention in routine child health surveillance consultations, providing advice on safety equipment, including participation in local equipment loan schemes, being involved in local healthy alliances for acddent prevention and undertaking training in accident prevention.[6] Health visitors' advice regarding

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home safety has been demonstrated to be effective in encouraging parents to make safety changes lo their homes,[12] but the effectiveness of other interventions such as post-aocident follow-up visits has yet to be demonstrated on a large scale.[13] Previous work examining the attitudes of health visitors towards accident prevention suggests that although many health visitors undertake such work, many feel inadequately prepared to do so.[7,8] Studies of attitudes towards health promotion and disease prevention suggest that many health visitors hold positive attitudes towards this area of work, believing themselves to be effective in changing people's lifestyles.[14,15] However, many also recognise the constraints on their health promotion work in general[14] and in accident prevention in particular, of a lack of time, resources and training.[7,8,16]

This study therefore aims lo assess health visitors' knowledge, attitudes and practices in accideni prevention, including those activities suggested by the *Healih of the nation* as being appropriate for health visitors to undertake.

Method

A questionnaire conceming knowledge of childhood accidental injury epidemiology, attitudes towards accident prevention and current practices in accident prevention was designed and piloted on a group of ten health visitors. The questionnaire and a stamped addressed envelope were mailed to all health visitors in Nottinghamshire, using the Community Unit's lists of health visitors employed as the sampling frame. Two further questionnaires were sent to non-responders.

The questionnaire consisted of four sections. The first consisted of attitudinal statements conceming accident prevention activities, including those suggested in the *Health of the nation.*[6] Possible responses ranged from strongly agree to strongly disagree on a five-point scale. The second section consisted of questions conceming current practice, with responses ranging from always to never, with a not applicable category, again covering the activities suggested in the *Health of the nation*.[6] The knowledge questions covered the subject matter included in the Child Atxident Prevention Trust's 'Picture of childhood accidents' questionnaire" with additional questions concerning risk factors for childhood acddental injuries. The questionnaire has also been used to evaluate primary health care team accident prevention training sessions in which the Child Acddent Prevention Trust's questionnaire was used, hence the necessity to cover the same subject areas The results of the evaluation of the training sessions will be presented elsewhere. The final section concerned personal and sociodemographic characteristics of (he health visilors such as age, sex, qualifications, experience in paediatric or school nursing, whether the respondent had any children and their children's accidental injury histories.

The data were entered and analysed using the SPSS-PC statistical package. A knowledge score was computed by totalling all correct responses. An attitude score was computed by totalling all strongly agree or agree responses to positive statements and all strongly disagree or disagree responses to negative statements. Comparisons of categorical data have been made using χ^2 tests, comparisons of knowledge and attitude scores by personal and sociodemographic characteristics have been made using Mann-Whitney U lests, and correlations between knowledge and attitude scores made using the Spearman rank correlation coefficient.

Results

A total of 186 usable questionnaires were returned by health visitors, giving a response rate of 88·5 per cent. All respondents, except two, were female. The age and number of years in health visiting practice are shown in Table 1. Eight per cent (14) were qualified children's nurses and 16 per cent (30) had also worked as a school nurse for six months or more. Seventy-three per cent (135) *of* the health visitors had children of their own. The children of over two-thirds (69 per cent) of the health visitors who were parents had attended an A & E department following an accidental injury, and the children of 13 per cent (17) of health visitor parents had been admitted to hospital following an accidental injury at some point in their lives.

Knowledge of accidental injury epidemiology

Health visitors' knowledge of accidental injury epidemiology in childhood is demonstrated in Table 2. More than eighty per cent of health visitors knew that accidental injury is the most common cause of death in children aged 1 -4 years (84·4 per cent) and aged five years and over (80·1 per cent), that most fatal accidents take place in the home under one year of age (86·6 per cent), and correctly identified risk factors for accidental injury including large family sire (83·9 per cent), socioeconomic deprivation (91·4 per cent) and family stress (96·8 per cent). The maximum knowledge score obtainable on the questionnaire is 23. The scores obtained by health visitors ranged from zero to 20. The mean score was 13·6 (SD 3·4), and the median and modal scores were both 13. There were no significant associations between knowledge score and any personal or sociodemographic details.

TABLE 1 Characteristics of respondents

Age (years)	No (%)	Years of health visiting practice	No. (%)
Under 35	46 (24·7)	Under 5	54 (29·0)
35-44	67 (36·0)	5-10	36 (19·4)
45-54	47 (25·3)	11-15	38 (20·4)
55-64	24 (12·9)	16-20	29 (15·6)
65 and over	1 (0·5)	>20	26 (14·0)
Total	185 (99·5)*	Total	183 (98·4)*

* One respondent did not indicate their age and three did not indicate the number of years of health visiting practice.

Attitudes towards accident prevention

Health visitors" attitudes towards accident prevention are shown in Table 3. Il demonstrates that many health visitors hold extremely positive attitudes to many accident prevention activities. Over eighty per cent agreed or strongly agreed that most accidents are preventable (88·2 per cent), that they can be effective in preventing accidents (89·8 per cent), that accident prevention should be discussed in child health surveillance consultations (96·7 per cent), that home visits provide a good opportunity to identify and discuss hazards in the home (96-7 per cent), that they should be involved in lobbying or campaigning oo local safety issues (88·1 per cent), that parents' groups provide a good opportunity to teach first aid (91-4 per cent) and that notifications from the liaison health visitor in the A & E department are useful for compiling a picture of the local acddent problem (96-7 per cent).

The maximum possible number of positive responses on the attitude score was 12. The health visitors' scores range from zero lo 12, with a mean score of 9·8 (SD 1·7), the median number of positive responses was 10 and the modal number was 11. There were no significant associations between personal characteristics and attitude score. There was, however, a significant positive correlation between knowledge and attitude scores ($r = 0{\cdot}21$, $p < 0{\cdot}01$).

TABLE 2 Healih visitors' knowledge of childhood accidental injury epidemiology

Question	No. answering correctly (%)
What is the most common cause of death in children < 1 year?	37 (19·9)
1 -4 years?	157 (84·4)
5 years and over?	149 (80·1)
What is the trend in child accident death rates in the UK over the last 20 years?	23 (12·4)
Which is the most common fatal accident in children < 1 year?	52 (28·0)
1 -4 years?	33 (17·7)
5 years and over?	105 (56·5)
What proportion of children attend an A & E department each year as a result of an accidental injury'	60 (32·3)
What percentage of the children attending an A & E department following an accidental injury are admitted to hospital?	96 (51·6)
Which home accident causes most A & E attendances in those under 1 ?	50 (26·9)
1 -4 years?	44 (23·7)
5 years and over?	41 (22·0)
Where do most fatal accidents occur in children under 1 year?	161 (86·6)
1 -4 years?	50 (26·4)
5 years and over?	120 (64·5)
Do girls have more accidents than boys?	117 (62·9)
Which of the following are risk factors for childhood accidental injury?	
Maternal age under 20 years	144 (77·4)
Single parenthood	130 (69·9)
Previous accidental injury	141 (75·8)
4 or more children in family	156 (83·9)
Socioeconomic deprivation	170 (91·4)
Family stress	180 (96·8)

TABLE 3 Health visitors' altitudes towards childhood accident prevention

Attitudinal statement	Agree or strongly agree (%)	Neutral (%)	Disagree or strongly disagree (%)
Most accidents are preventable	164 (88·2)	20(10·8)	0(0)
I believe HVs can be effective in preventing childhood accidents	167 (89 8)	17(9·1)	1 (05)
Accident prevention is not a priority for me in child health care	16 (8·6)	10(5·4)	159 (85·5)
Other primary health care team members have a greater responsibility for accident prevention than the GP-HV	8 (4·3)	23(12·4)	154 (82·8)
Accident prevention should be discussed in child health surveillance consultations	180(96 7)	3(1-6)	1 (0·5)
Home visits provide a good opportunity to identify and discuss hazards in the home	180(96 7)	5 (2·7)	0(0)
Notifications from the liaison HV at A&E are useful for building up a picture of the local accident problem	164 (88·2)	16 (8-6)	4(2·1)
HVs should be involved in lobbying or campaigning on local safety issues	139 (74·7)	46 (24·7)	0(0)
It is important for practices or clinics to display posters and leaflets on accident prevention whenever possible	170 (91 4)	15(8·1)	0(0)
Parents' groups such as mother and toddler groups provide a good opponunity for the HV to teach first aid	144 (77 4)	30 (16·1)	8(4 3)
It is important for HVs to undertake post-accident follow-up visits to discuss accident prevention	132 (71 0)	50 (26·9)	2(1·1)
It is not appropriate for HVs to do home safety checks to identify hazards in the home	49 (26 3)	62 (33·3)	71 (38·1)

Current practice in accident prevention

Current practices in accident prevention among health visitors are demonstrated in Table 4. The activities most commonly undertaken are identifying hazards in the home and discussing them with parents on home visits (78 per cent) and giving advice on safety equipment al the eight-month hearing test (66·7 per cent). The activities least often undertaken include running first aid sessions in parents' groups (17·8 per cent), lobbying or campaigning on local safety issues (17·7 per cent) and working on a local child safety group (13·4 per cent).

Fifty eight per cent (108) of health visitors had made contact with representatives of at least five other agencies concerning child safety in the preceding two years. The agencies or organizations most commonly contacted included housing departments of local councils (contacted by 80 per cent of health visitors), other health visitors (contacted by 73 per cent), general practitioners (contacted by 70 per cent), environmental health departments of local councils (contacted by 58 per cent) and local schools or nurseries (contacted by 56 per cent). Less than 10 per cent of health visitors had had contact with a public health physician (9 per cent), the Family Health Services Authority health promolion advisor (7 per cent) and with the ambulance service (3 per cent).

For all activities more health visitors agreed or strongly agreed that an activity should be undertaken, than always or often undertook that activity. Only 22 per cent of those agreeing or strongly agreeing that parents' groups provide a good opportunity lo teach first aid, or that health visitors should be involved in lobbying or campaigiung about local child safety issues did so on a regular basis. Sixty one per cent of those agreeing or strongly agreeing that post-accident visits were important regularly made such visits, 68 per cent of those believing that acddent prevention should be discussed in routine child health surveillance contacts regularly gave advice about safety equipment at the eight-month consultation, and 81 per cent of those believing that home visits provide a good opportunity to identify and discuss hazards in the home regularly did so.

TABLE 4 Healih visitors' current practices m accideni prevention

Current practice	Always or often (%)	Sometimes (%)	Rarely or never (%)
How often. il ever. do you give advice about safety equipment In the 8-month hearing test?*	124 (66 7)	44 (23·7)	10(5·4)
How often. if ever. do you identify hazards in the home on home visits and discuss Ihem with parents?	145 (780)	37(19·9)	0(0)
How often. il ever. when advising about safety equipment. do you give details of local stockists or local equipment loan schemes?	92 |49 4)	67 (36·0)	25 (134)
If you give advice about safety. how often. if ever. do you also give parents a safety leaflet?	80 (43 0)	84 (45 2)	22 (11·8)
If you run a parents' group. e.g. mother and toddler or post-natal group. how often. if ever, do you run a session on preventing accidents?	86 (46 2)	21 (11·3)	6 (3·3)
If you tun a parents' group. e.g. mother and toddler or post-natal group. how often. if ever. do you run a session on first aid?	33 (178)	43(23·1)	35 (18·8)
When you receive notification of a child anending the A & E department following an accident. how often. if ever. do you do a home visit to discuss accident prevention?	89 (47 9)	78 (41·9)	13 (7·0)
	Yes	No	Don't know
I have analysed data on accidents to children on my caseload in the last 2 years	81 (43 5)	94 (50·5)	5 (2·7)
I have worked with a local child safery group within the last 2 years	25 (13 4)	152 (81·7)	0(0)
I have lobbied or campaigned on a local safety issue as an individual within the last 2 years	33(17 7)	150 (80·6)	0(0)
I have attended a course or lecture on child accident prevention in the last 2 years	58 (31·2)	125(67·2)	1 (05)

* The 8-month hearing test was chosen as an example of a child health surveillance consultation as the child health surveillance programme varies across Nottinghamshire. depending on local needs. but the 8-month hearing test is undertaken in all areas.

Discussion

The response rate of 885 per cent in this study is high for a postal questionnaire survey, and is comparable with similar surveys of health visitors' attitudes towards health promotion in general and accideni prevention in particular.[8,14,15] Even if the 24 health visitors in Nottinghamshire who did not respond held negative views of accident prevention, the results would still be extremely encouraging. The majority of health visitors agree or strongly agree that most accidents arc preventable, that they can be effective in preventing them and that acddent prevention is a priority for them in child health care. The majority also agree that it is important for them to undertake the activities suggested in the *Health of the nation*,[6] and many accept that they are the primary health care team member with the greatest responsibility for acddent prevention. They are aware of the great threat posed to children's lives by accidental injuries, the location of most fatal accidents and the risk factors for accidental injury. A minority are aware of the type of acddent which most commonly requires attendance at an A & E department, probably reflecting the use of a set of selective criteria for notifying health visitors in Nottingham of childhood attendances at the A & E dcpartmenl. Most health visitors thought bums were the most common injury presenting at an A & E dcpartmenl in children under the age of five years, which is one of the injuries routinely notified to them. This suggests their perception of the pattem of childhood injuries may be based on their experience of receiving notifications of children attending the A & E department.

There are some discrepancies between attitudes and practices in accident prevention among health visilors. For all activities covered in the questionnaire, a greater number of health visilors believe that it is important for them to undertake such activities than the number who regularly undertake them. This gap between attitudes and practices is interesting because it suggests that health visitors may experience barriers lo undertaking more accideni preveniion in their everyday work. This study did not address what those barriers may be, although previous studies have suggested a lack of time, lack of educational materials and a lack of training.[7,8,16] Only 31 per cent of health visitors have attended a course or lecture on child accideni preveniion in the last two years, which would suggest that there is a lack of training opportunities in this subject matter,[8] as would the deficiencies in knowledge concerning childhood accidents which this study has demonstrated. The extremely positive attitudes found in this study also suggest that there may be opportunities for further increasing accident prevention work by building on these positive attitudes and by the removal of the barriers perceived by health visitors

Il is encouraging that so many health visilors are already undertaking a wide range of accident prevention activities, in particular that 78 per cent are identifying hazards in the home on home visits and discussing them with parents, as this has previously been demonstrated to be effective in facilitating parents to make safely changes lo their homes.[12] When parents have been asked about their views of the health visitors' role in accident prevention, they have identified three safety needs which they think health visitors could fulfil." The first is information and advice about safety equipment, including what is available where, sources of second-hand equipment or loan schemes, and information about standards. Only 67 per cent of health visitors always or often gave advice about safety equipment in the eight-month hearing test, and only 49 per cent regularly gave information about local stockists or loan schemes. As parents have identified this as one of their safety needs, il would be appropriate for health visilors to incorporate such advice into routine child health surveillance. Previous work has also demonstrated that parents and health visitors perceive cost as a major factor in parents not obtaining safety equipment;[8,18] despite this, less than half of the health visitors are giving advice about local equipment loan schemes. Again, this is information that could easily be incorporated into a child health surveillance protocol. Parents also identified a need for first-aid knowledge and skills which they perceived could be met by the health visitor; however, only 60 per cent of health visilors ran parents" groups, and of those, only 30 per cent regularly gave sessions on first aid; again, such a session could routinely be offered to parents' groups.

Post-accident follow-up visits lo discuss the recent accident and look at strategies for preventing future accidents have repeatedly been suggested as one of the health visitors' roles in accideni prevention.[7-9,16] Parents have reported negative experiences of such visits;[17] in particular, they often fell the health visitor did not believe their accounts of how the accident happened or fell that the accideni may be perceived by the health visitor as non-accidental. They also felt a lack of support in dealing with their feelings of guilt, and felt they had been singled out lo be checked up on. The difficulties of undertaking such visits for health visitors has already been recognized' and resources have been developed to meet training needs in this area.[16] The finding in this study that only 48 per cent of health visitors regularly undertook such visits may reflect the difficulties inherent in this work Discussions with local health visitors suggest that other reasons may also be important, such as late receipt of notifications from the A & E department or notification of accidents in which no injury occurred or only extremely minor injury occurred, where the health visitor felt it was inappropriate to visit. It has been demonstrated that children under five years attending an A & E department arc al an increased risk of suffering an acddental injury that will require hospital admission in the future, and as such these children represent a high-risk group for accidental injury."However, in view of the difficulties of undertaking post-accident visits, both for parents and for health visitors, it is important that their effectiveness is evaluated before they are routinely incorporated into practice

There has recently been increasing concern over the possible erosion of public health tasks in health visiting as a result of general practice fundholding.[10,20] The opportunities afforded by undertaking accideni prevention activities on a multi-agency, community-wide basis have been emphasized.[21-23] Practice populations, however, often are not whole communities; consequently, there may be pressure on health visitors lo concentrate on the practice population rather than on the local community.[10] This may encourage a move back to a service based on an individualized, one-to-one approach. The results of this study suggest that many health visitors have a positive attitude towards lobbying and campaigning on local safety issues; however, only a minority regularly undertake such activities. This may reflect a lack of training in such work, or a lack of time, which is needed for developing local networks and building healthy alliances. The extension of general practice fundholding may further limit the opportunities for this type of work. At the time of undertaking this study, few practices in Nottinghamshire were fundholders. so the possible effects of this on health visiting activity could not be examined. However, unless fundholding practices understand the need for health visitors to use a community approach in accident prevention, some of the opportunities for acddent prevention will be missed, al the expense of the practice population.

In conclusion, many health visitors are already undertaking a range of accideni prevention work and hold p>ositive attitudes towards the activities suggested in the *Health of the nation*.[6] Some of the safety needs previously identified by parents are not routinely incorporated into current practice by the majority of health visilors, and in such cases their incorporation inlo child health surveillance protocols may encourage more health visitors to undertake these activities. It has been suggested that post-accident follow-up visits are routinely undertaken by health visitors; however, this is not current practice for many health visitors. Many difficulties in undertaking such visits, both for parents and for healih visitors, have been identified. The lack of evidence conceming the effectiveness of such visits suggests that they should not be incorporated into routine practice until this has been demonstrated. It is possible that the accident prevention activities of health visitors may be constrained by the effect of general practice fundholding, but as yet the impact of fundholding on this area awaits evaluation.

Acknowledgements

We would like to thank the health visilors in Nottinghamshire for completing the questionnaires. We would also like to thank the Child Accident Prevention Trust for permission to adapt and use their 'Picture of childhood accidents' questionnaire. This research was funded by the Department of Health.

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Accepted on 18 October 1994

Injury prevention programmes in primary care : a high risk group or a whole population approach?

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Abstract

Objective: To examine the relationship between risk factors for childhood unintentional injury and injury outcome and to assess the feasibility of using risk factors to identify children at high risk of injury.

Setting: One general practice in Nottingham, United Kingdom.

Method: A postal questionnaire survey to all parents of children registered with the practice (n=771) to obtain data on risk and socio-demographic factors. All children still registered with the practice one year later were followed up for occurrence of a medically attended injury.

Results: The response rate was 78%. The injury rate over the follow up year was 246 injuries per 1000 children. Previous medically attended injury was associated with each of the injury outcomes (odds ratio for all attendances, 2.33, (1.37, 4.05); for accident and emergency attendances, 2.27 (1.15, 4.4) and for primary health care team attendances, 2.58 (1.33, 5.0)). Male sex was associated only with accident and emergency department attendance (odds ratio 2.13 (1.06, 4.2)). Matemal age and previous injury were associated with a higher number of injuries in the subsequent year on univariate and multivariate analyses. The sensitivity and positive predictive value of the risk factors were low, except for previous injury and male sex. The number of children needing an injury prevention intervention to prevent one injury as identified by the risk factors was not significantly different fi-om that required if a whole population approach were to be used.

Conclusion: Primary care based injury prevention programmes, at present, should not be targeted at children identified as being at "high risk" of injury. Nevertheless, a larger study using a wider cross section of the population is needed to address this issue fiirther.

Keywords:

primary care, injury prevention programme, preventive strategy

This paper presents the results of a study undertaken at one general practice in the United Kingdom as part of the process of planning an injury prevention intervention study. As part of planning the study, it was important to consider whether the interventions should be offered to all children or only to children identified as being at high risk.

Many factors have been identified as being associated with an increased risk of unintentional injury in childhood, such as male sex, family size and structure, previous medically attended injury, young matemal age at birth of first child and various measures of socioeconomic status[1-10]. Over recent years there have been suggestions, including the Governments health strategy for England [3,4,11,12], that injury prevention programmes should be targeted at children at high risk of injury.

Several workers have discussed the difficulties of doing this. The Child Health and Education Study found that case definition was important in determining which factors were associated with injury. So, for example, the risk factors associated with having one or more medically attended injuries differed fi"om those associated with admission to hospital for an injury [10]. A second problem is that the sensitivity and positive predictive value of some factors in predicting which children will have injuries has been found to be low. This suggests that only a small proportion of injuries could be prevented by targeting injury prevention at children identified by this method [2].

The altemative to targeting injuiy prevention to those at high risk, is to use a population approach. This is feasible in primary care in the UK, where all children aged under 5 years see a general practitioner or practice nurse at least once a year [13] A programme of primary care based child health surveillance currently exists, and has been found to reach children at high risk of injury [14]. This could be used to offer systematic age-specific anticipatory injury prevention as described by the TIPP programme [15].

This study, therefore, examines the relationship between risk factors and injury outcomes and assesses the feasibility of using risk factors to identify children at high risk. The findings inform the decision regarding using a whole population or a targeted approach in a primary care intervention study.

Method

A postal questionnaire was sent to all parents and older children (age 12 to 16 years) registered with the practice in 1993 (N=771). Non responders were reminded by telephone after two weeks and sent a fiirther questionnaire if requested. Non responders without a telephone were sent a second questionnaire. The questionnaire contained two sections; the first concemed age-specific questions on safety practices and safety equipment possession and use, the results of which were not used for this study. The second section contained questions about risk factors for unintentional injury as identified fi"om the published Uterature [1-10] and socio-demographic details. The reliability of the questionnaire was assessed by a test-retest procedure on a sample of 34 mothers from a child health clinic in a location with a similar socio-economic profile to that of the study population. Consistency of responses was assessed by calculating kappa coefficients. The responses to four questions (age, sex, postcode, previous medically attended unintentional injury) were validated fi^om the medical records of a systematic one in ten sample of children of responders still registered with the practice one year after the survey. Where a child had left the practice the next child on the list was used. Kappa coefficients were calculated to asses the degree of agreement between the responses on the questionnaire and the data in the medical records.

One year later, all children still registered with the practice were followed up for the occurrence of injuries, by a manual and computer search of the primary care records and a computer search of the hospital records at the only local hospital with an accident and emergency (A&E) department. Injuiy severity was calculated using the 1990 version of the Abbreviated Injury Scale [16]. Non responders to the questionnaire who were still registered with the practice were followed up in the same way. The outcomes used for this study were primary care and A&E attendances and hospital admissions for unintentional injury.

The data were analysed using χ^2 tests for categorical data . As the number of injuries by each risk factor was skewed to the left, comparisons were made by transforming the data using $\sqrt{x+1}$ for the number of injuries and by undertaking unpaired t-tests. Multivariate analyses, using logistic regression were conducted with the outcomes of any attendance at any health care facility for unintentional injury or not, primary health care team attendance or not, A&E department attendance or not, or hospital admission or not. Muhiple linear regression analysis was used to adjust for confounding factors for the number of injuries. All data were analysed using the SPSS-PC package. The estimated number of children needing an injury prevention intervention to prevent one injury was calculated using the numbers needed to treat method described by Sackett et al [17] based on an estimated 10% reduction in injury fi-equency achievable by a primary care based intervention [18,19].

Results

587 questionnaires were retumed, giving a response rate of 78%. Twenty one of the questionnaires used for reliability testing were retumed (62%). Twelve questions had identical responses on both questionnaires and a kappa coefficient of 1.00. The remaining two questions had kappa coefficients of 0.94 and 0.87.

The age, sex of the child and postcode recorded on the questionnaires were identical to that recorded in the notes for all 58 children. The kappa coefficient for medically attended injuries was 0.81.

The age distribution of children for whom questionnaires were completed did not differ significantly from that of the non responders (χ^2 = 6.1, 4 degrees of freedom, p=0.19), but significantly fewer parents of girls responded (χ^2 = 9.6, 1 degree of fi-eedom, p=0.002). Over the one year follow up period, 47 children left the practice. Of the 540 children still registered, 96 children had a total of 133 injuries, accounting for 141 attendances at a health care facility. Seventy of these attendances were treated by the primary health care team, 67 at the A&E department, and 4 children were admitted to hospital following injury. The injury rate was 246 injuries per 1000 children per year, that for non responders was 357 per 1000 (χ^2 = 3.27, 1 degree of fireedom, p=0.07). The AIS scores of all injuries ranged fi^om 1-3, with 87% having a score of one. Not surprisingly, with such little variation in scores, there were no significant associations between injury severity and any of the risk factors.

Based on univariate analyses, only a history of a previous medically attended injury was significantly associated with attendance at any health care facility, attendance at the A&E department and at the primary health care team. Male sex was significantly associated with attendance at the accident and emergency department only. None of the other factors showed any significant association with any injury outcome.

The relative risks and 95% confidence intervals for each injury outcome by each risk and sociodemographic factor are shown in table 1. Logistic regression models were fitted for each outcome variable. Models were built using forward and backward stepwise selection and by entering all variables on one step. Each method produced identical models for each outcome. The final model for all injury attendances and for primary health care team attendances included only previous injury (odds ratio 2.33, 95% CI 1.37, 4.05 and odds ratio 2.58, 95% CI 1.33, 5.00, respectively). The final model for A&E attendances included male sex (odds ratio 2.13, 95% CI 1.06, 4.20) and previous injury (odds ratio 2.27, 95% CI 1.15, 4.40) These models were used to estimate the probability of each injury outcome based on the presence or absence of the significant factors. A history of previous medically attended injury increased the probability of a medically attended injury over the next year from 0.26 to 0.43, and that of primary health care team attendance fi-om 0.16 to 0.27. Being male and having a history of previous medically attended injury increased the probability of A&E attendance over the next year fi-om 0.28 to 0.52.

Using the number of injuries as the outcome measure, previous medically attended injury and young matemal age at birth of first child were associated with a significantly higher number of injuries (table 2). Multiple linear regression produced identical results as the univariate analyses. The predicted number of injuries in the subsequent year, based on the final regression equation for a child with a mother aged over 20 at the birth of her first child who has had at least one previous medically attended injury is 1.11, whereas a child with a mother aged 20 or under at the birth of their first child who has not had a previous medically attended injury has a predicted number of injuries in the subsequent year of 0.99.

The number of children and the number of injuries occurring to children in each risk factor group is shown in table 3, along with the sensitivity, specificity and positive predictive value for each factor in predicting which children will suffer fiiture injury. These results demonstrate that the sensitivity and positive predictive value is low for most factors; thus the number of children needed to be targeted for injury prevention does not differ significantly fi:om the number who would need to receive an intervention if a population approach was used.

Discussion

It has not been possible in this study to **replicate** the associations previously found between risk factors for childhood injury and many injury outcomes. As a resuh of this, such risk factors for unintentional injury have not been found to be efficient in identifÿing a high risk group for targeting primary care injury prevention interventions. There are four possible explanations for this lack of association: chance, bias, confounding, or that no association exists.

A posteriori sample size calculations based on the actual number of children with each risk factor and the proportion without the risk factor who experienced an injury in the follow up year, suggests that the study was sufBciently powerful (80% power, 5% significance level) to detect a relative risk of a medically attended injury of less than 2 for male sex, four or more children in family, non-owner occupation, receipt of means tested benefits and previous medically attended injury. As attendance at the primary health care team and at the A&E department were less common outcomes, the study was only able to detect larger relative risks for these outcomes. Previous studies have found relative risks of this magnitude (i.e. 2 or less) for child age, matemal age, single parenthood, previous medically attended injury, sex and socioeconomic disadvantage [1,2,3,5,12,20-24]. Therefore, it seems unlikely that a type II error can explain the lack of association found between most risk factors and having at least one medically attended injury.

Previous work suggests that responders to postal questionnaires often differ fi^om non- responders in terms of demographic and socioeconomic factors such as age, sex, social class, ethnicity '^^'^ and single parenthood [27,28]. It is therefore possible that the parents of children most at risk of injury may have been less likely to respond to this survey. A response bias did occur whereby female children and older children with a history of previous medically attended injury were under-represented among the responders. Also, the unintentional injury rate over the follow up year was higher in children of non responders. The injury rate among children of responders is however similar to that found in previous studies in primary care and A&E settings [13,29,30], so it is unlikely that response bias will have a major effect on the resuhs. Assuming that all children of non-responders had a history of previous medically attended injury and experienced the injury rate for non-responders found in this study, the relative risk for a fiiture injury in those with a history of previous injury would increase from 1.79 to 2.05, which would not substantially alter the results.

It is possible that the variables used in this study have not been able to identify a group of children at high risk of injury because of changes in social stmcture over time or because of the relatively affluent population used in this study [31]. Much of the work on risk factors for unintentional injury originated from the Child

Health and Education Study, which commenced 25 years ago, based on a population comprising all children bom in one week. Some variables are directly comparable between the two studies: the Child Health Education Study had less than 5% of their study population with 4 or more children in each family [7], compared to 11.8% in this study; less than 5% of the children came firom single parent femilies' compared to 9.7% in this study, and 8.6% of mothers whose first child was bom before the age of 20 years [8] compared to 6.5% in this study. Changes in social stmcture over time may mean that single parenthood or young motherhood, for example, do not describe a similar group of people today as it did 25 years ago. Single parenthood is becoming increasingly common and single parents are an increasingly heterogeneous socioeconomic group [33]. Matemal age at birth of first child has risen over the same period [34]. The children of such single parents or young mothers today may therefore have differing risks of injury.

The experience of poverty or disadvantage cannot be separated from social context, hence variables used to describe socioeconomic status may reflect different life experiences in a relatively affluent area than in a deprived area. For example, non owner occupation in an affluent area may be a qualitatively different experience than non owner occupation in a deprived area where other facilities such as safe play or leisure areas are less likely to be available. Such variables may therefore be less useful for identifying children at risk of injury within an affluent area.

A further difficulty with some of the indicators used in this study is that the presence of the indicator may be less important than duration. For example, long term unemployment is likely to reflect different socioeconomic-economic circumstances than short term unemployment, such as increasing financial difficulty, increasing frequency of stressfiil life events, decreasing **quality** of the home environment, increasing social isolation and reduced self esteem [32], all of which may be important in preventing injury. This study did not measure duration of indicators of socioeconomic disadvantage, but it may be useful for fiiture work in this area to do so.

Confounding factors such as proximity to hospital, matemal inexperience in dealing with injury and non accidental injury are unlikely to explain the observed results. The practice area is geographically small and located close to the A&E department. Children with older mothers were found to suffer a greater number of injuries than children with younger (and possibly more inexperienced) mothers. This is contrary to what would be expected if matemal inexperience was a confounding variable. At present none of the children registered with the practice are on the child protection register, so non-accidental injury is unlikely to be a plausible explanation.

Insufficient power, bias and confounding therefore do not provide adequate explanation for the lack of an association between the risk factors and the injury outcomes. Three recent studies of attendances at A&E departments for unintentional injury have also failed to find associations between area-based measures of deprivation and attendance [12,36,37]. A case control study undertaken in Glasgow in 1995 found only previous injury and male sex to be significantly associated with such attendances following unintentional injury, with similar odds ratios to those found in this study, but no association between an area based deprivation score or ethnicity and attendance for injury [12]. Lyons and colleagues, in a larger A&E department based study using the Townsend index of deprivation suggested that their failure to find an association may be explained by the ecological fallacy where the association at an aggregate level does not necessarily represent the association found at the individual level [36]. This may occur if the Townsend index does not describe homogenous areas, in which case data at the level of the individual will be more useful than aggregate data. The lack of any associations between the individual components of the index and any of the outcomes does not support this hypothesis, but further work is needed with a larger sample size to examine the relationship between individual measures of deprivation and injury outcome before stronger conclusions can be drawn about the ecological fallacy.

Finally the results of this study may not be generalisable to fatal and severe injuries, as the majority of injuries studied here were minor. Walsh and Jarvis [35] examined cases of moderate (ISS≥4) or severe injury (ISS ≥9) and death and found a significant association between socio-economic status (measured by Townsend index) and injury. The gradient was steepest for fatal injuries and least steep for more minor injuries. Where strong associations exist between severe or fatal injuries and risk factors, targeting injury prevention may be worthwhile.

Implications for prevention.

The failure to find significant associations between risk factors and a range of injury outcome measures suggests that, at present, primary care injury prevention programmes should not be targeted using these risk factors. Such a strategy should await further work to confirm or refute this finding in a larger population with a wider cross section of socio-economic status. The low sensitivity and positive predictive value for each of the factors (except male sex and previous injury) means that for most risk factors the factor will miss most of the children who will have an injury in the subsequent year, whilst identifying a large proportion of children as being at high risk who will not have an injury. The high specificity for most factors means they will correctly identify most of the children who will not have an injury. It is unlikely that this study failed to detect strong associations between these risk factors and injury outcome. High values for sensitivity and positive predictive value for each risk factor would only be obtained if the association between the factor and the injury outcome was strong. It is therefore unlikely that even if larger studies did find associations this would substantially alter the conclusions regarding using risk factors for targeting injury prevention.

This study, therefore, supports previous suggestions that targeting injury prevention at groups of high risk children is not efficient in terms of the number of children that would have to be targeted and the potential number of injuries prevented. Instead, as children have repeated contacts with members of the primary health care team, especially in the first five years of life it is suggested that primary care injury prevention programmes should use a population approach.

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Table 1. Relative risk of primary health care team attendance, accident and emergency department attendance and attendance at any health care facility for unintentional injury, by univariate analyses of risk and sociodemographic factors. (95% confidence interval).

Risk or socio-demographic factor	No of children with risk factor¶	Primary Health Care Team attendance	Accident and Emergency department attendance	All attendances
Male sex	292	1.08(0.65,1.79)	1.68(1.01,2.80)	1.19(0.82, 1.74)
Age under 5	187	1.0(0.59, 1.70)	0.80(0.49, 1.29)	0.97 (0.66, 1.41)
≥4 children in family	62	1.29(0.64,2.62)	1.3(0.67,2.53)	1.18(0.69,2.0)
Single parent family	57	1.95(0.98,3.87)	0.92(0.41,2.04)	1.06(0.59, 1.88)
Non-owner occupiers	62	1.27(0.63,2.58)	0.44(0.14, 1.36)	0.92(0.5, 1.69)
No access to car	37	1.05(0.4,2.77)	0.73 (0.24, 2.23)	0.77(0.33, 1.8)
Ethnic group non white	22	t	0.40 (0.06, 2.74)	0.25 (0.04, 1.69)
Receipt of means tested benefits	79	1.39(0.74,2.59)	0.66(0.26, 1.49)	0.99(0.57, 1.67)
Matemal age ≤20 at birth of first child	35	0.79 (0.26, 2.43)	0.7(0.23,2.19)	0.8,(0.34, 1.85)
Previous medically attended injury	239	1.79(1.06,3.02)	1.64(1.01,2.68)	1.52(1.04, 2.21)
Overcrowding	28	1.7(0.73,3.98)	0.65(0.17,2.55)	1.01 (0.44, 2.32)
Unemployment	20	1.43(0.48,4.25)	0.47(0.07,3.21)	1.11(0.44, 2.77)
Townsend score above zero	97	1.28(0.71,2.31)	1.01(0.84, 1.9)	1.07(0.67, 1.71)

¶n=540. Cases with missing data on a particular variable have been excluded.
t no children with an ethnic origin classified as non white had an unintentional injury leading to a primary health care team attendance over the follow up year

Table 2. Univariate analyses of the mean number of injuries by risk and socio-demographic factors.

Risk or socio-demographic factor	No.	Mean no. of injuries	SD	t	df	p(2 tailed)
Male	292	1.06	0.28	-0.38	534	0.70
Female	246	1.06	0.22			
Age under 5 years	187	1.05	0.26	0.81	538	0.41
Age 5 years and over	353	1.07	0.24			
< 4 children in family	474	1.06	0.24	-0.96	72	0.34
≥ 4 children in family	62	1.10	0.30			
Ethnic group white	489	1.06	0.25	2.04	39	0.05
Ethnic group non white	22	1.02	0.09			
Single parent family	57	1.10	0.32	0.91	64	0.37
2 parent family	465	1.06	0.24			
No access to car	37	1.04	0.28	0.54	525	0.60
Access to car	490	1.07	0.25			
Owner occupier	466	1.06	0.25	0.03	526	0.98
Non owner occupier	62	1.06	0.25			
Receipt of benefits	79	1.07	0.31	0.22	96	0.83
No benefits received	445	1.06	0.24			
Matemal age ≤20	35	1.05	0.35	-2.60	468	0.01
Matemal age >20	435	1.10	0.25			
Unemployment	20	1.09	0.30	1.22	538	0.22
No unemployment	520	1.07	0.25			
Overcrowding	28	1.08	0.35	0.22	28	0.83
No overcrowding	511	1.06	0.24			
Resident in non deprived area	394	1.07	0.24	1.02	127	0.31
Resident in deprived area	97	1.04	0.30			
Previous injury	239	1.10	0.28	2.77	445	0.006
No previous injury	289	1.04	0.22			

Table 3. The sensitivity, specificity and positive predictive value of risk and socio-demographic variables for predicting future injury and the number of children in each risk factor group needing to be targeted for injury prevention to prevent one injury.¶

Risk or socio-demographic factor	Sensitivity (%)	Specificity (%)	Positive predictive value	No. children to target per injury prevented (95% CI)
Male sex	59.4	46.8	19.5	38 (24,52)
Age under 5 years	35.4	65.5	18.2	38 (27,49)
≥4 children in family	13.7	88.9	21.0	27(21,33)
Single parent family	11.6	89.2	19.2	25(19,31)
Non-owner occupiers	10.7	88.0	16.1	43 (36,50)
No access to car	5.3	92.6	13.5	33 (28,38)
Receipt of benefits	14.9	84.9	17.7	30 (23,37)
Ethnicity	1.1	95.0	4.5	25 (17,33)
Matemal age ≤20	5.8	92.2	14.2	34 (29,39)
Previous medically attended injury	57.4	57.4	22.6	29 (20,38)
Overcrowding	5.3	94.8	17.9	54 (49,59)
Unemployment	4.2	96.4	20.0	50 (46,54)
Townsend score > 0	21.1	80.5	19.6	34 (26,42)
Whole population				38(18,58)

¶ estimated 10% reduction in injury frequency as result of injury prevention intervention[18,19]

Appendix C:

Covering letter and questionnaire used for the study presented in chapter 2

Dr KG Bratt
Dr OM Livesey
Dr D Kendrick

178 Musters Road
West Bridgford
Nottingham
NG2 7DR
Tel 0602 814472

14th October 1993

Dear Parent,

We know that accidents are very common in children and we are interested in learning more about how you, as parents help keep your children safe. As a practice we would like to find out if there is anything we can do to help you with this task.

Alison Woods, a third year medical student at Nottingham University is helping us with this work and is sending out this questiormaire to all parents registered with our practice. Please can you fill in the questiormaire and tell us what you think about child safety. <u>It should only take 10 minutes of your time.</u> All your answers will be treated in the strictest confidence and will only be used for this study about children's accidents.

If you have any queries about the questionnaire, please do not hesitate to contact Dr Kendrick at the surgery or Alison at the University on Nottingham 709301, and we will try and answer your questions.

When you have completed the questionnaire, please post it back to us in the <u>freepost</u> envelope provided.

Thank you very much for your help,

Best wishes,

Yours faithfully,

Dr Denise Kendrick
General Practitioner

Alison Woods
Medical Student

These **questions** are only about your child aged **upto** 12 months

SECTION 1 This is about your child and your home
Please tick one box for each question

1. How often, if ever, does your baby have a **piloow** in his/her cot?

always	sometimes	never
☐ 3	• 2	☐ 1

2. How often, if ever, does your baby have a duvet in his/her cot?

always	sometimes	never
☐ 3	• 2	☐ 1

3a. Is your water temperature set at below **54^0C (129^0F)?**

yes	no	don't know
•,	☐ 3	☐ 2

3b. If not, or you do not know, how often do you put cold water in the bath first when bathing your baby?

always	sometimes	never
• 3	• 2	☐ 1

4. How often, if ever, do you check your babies toys for small aprts that could be pulled off?

always	sometimes	never
• 3	• 2	☐ 1

5. Does your baby have any toys that are **small** enough to fit completely into his/her mouth?

yes	no	don't know
• 3	• 1	☐ 2

6. When something **unexpected** has happened, e.g. the doorbell or phone has rung, have you ever **left** your baby alone on a bed, table or other raised surface?

yes	no
☐ 3	•,

7. When something unexpected has happened, e.g. the doorbell or phone has rung, have you ever **left** your baby alone in the bath?

yes	no
☐ 3	D1

8. How often, if ever, does your baby have a dummy or toy on a curly flex or ribbon around **it's** neck or attached to it's clothing?

always	sometimes	never
☐ 3	☐ 2	☐ 1

9. How often, if ever, do you drink hot drinks whilst holding your baby?	always ☐3	sometimes ☐2	never ☐1
10a. Do you have any smoke alarms in your home?	yes •.	no ☐3	
10b. If so, are they all fitted and working?	yes •.	no •3	don't know ☐2
11.Is your baby walking, crawling or bottom **shufling?**	yes •1	no ☐2	

If yes, please answer questions 12-15. If no, please go onto section 2.

12a. Do you have any stairs in your home?	yes • 1	no ☐2
12b. If yes, do you have any **stairgates?**	yes ☐1	no ☐3

12c If yes, please say where you use them:

☐3 do not use it
☐I bottom of stairs
☐1 top of stairs
☐ 1 top and bottom of stairs
☐4 other, please say where:

____

13. Do you store cleaning materials out of the reach of your child?	yes • 1	no ☐3
14. Do you store medicines out of the reach of your child?	yes • .	no ☐3
15a. Do you have any gas. electric or coal fires in your home?	yes ☐1	no ☐2
15b. If yes, do you have any fireguards?	yes ☐1	no ☐3
15c If yes, on how many fires do you have fireguards?	☐1 on all fires	☐2 some fires

Please go onto section 2 now.

SECTION 2 - This is about what you think about safety
- Please fill in the space with an age, or write "never safe"

What is the youngest age at which you think generally a child can do the following things safely?

1. Be left alone to look after other children?____________________years old

2. Wear a normal adult seat belt in a car?____________________years old

3. Have a bath without adults watching?____________________years old

4. Sleep in a bed with a pillow?____________________years old

5. Sleep in a bed with a duvet?____________________years old

6. Walk down stairs on their own?____________________years old

7. Be held on an adults lap in a car?____________________years old

8. Play with objects small enough to go into their mouth?____________________years old

This is the end of section 2. Now go onto section 3.

SECTION 3 - **This is about you and the child in this survey.**
- **Please** tick one box for each question.

1. The child in this survey's exact age is

__________ months

2. The child in this survey is a

☐1 **boy** ☐2 girl

3. I am the child in this survey's

☐1 mother
☐2 father
☐3 grandparent
☐4 other

*(please say)*____________________

4. The number of children in my family is (including adopted and step children)

(please give a number) __________

5. I am

(You don't have to answer this question if you don 7 want to)

☐1 White
☐2 Black-Caribbean
• 3 Black African
• 4 Indian
• 5 Pakistani
• 6 Chinese
• 7 Other

*(please say what)*________________

6. I live

(You don't have to answer this question if you don't want to)

☐1 alone
• 2 with my partner and children
• 3 with my partner and other adults as well as my children
• 4 with other adults as well as my children

7. **I am**

☐1 looking after the home fill! time

☐2 working in a paid job, fiill or part time

☐3 unemployed

☐4 other

*(please say what)*___________

8. My **partner is**

☐1 looking after the home fill! time

☐2 woridng in a paid job, fiill or part time

☐3 unemployed

☐4 other

*(please say what)*___________

9. I and my **family**

☐1 rent from the council

☐2 rent privately

☐ 3 own our own home

☐4 other

*(please say what)*___________

10. The **total** number of people living in our **home** is

(Please give a number) _____

11. The **total** number **of** rooms in our home is
*(do **not** count kitchens less than 6 feet wide, **bathrooms** or toilets)*

(Please give a number) _____

12. My **postcode** is

____

13. My family usually has the use of a car ☐1 yes ☐2 no

14. I receive one or more Government benefits other than child benefit ☐1 yes ☐2 no

If you are the mother of the child in this survey, please answer question 15. Otherwise, please go onto question 16.

15. When my first child was bom, my age was______________________________years

16. Has the child in this survey had an accidental injury that has been treated by a GP or at a hospital casualty department? ☐1 yes ☐2 no

If you have any comments about the questionnaire, or if there is anything else you would like to say about keeping your child safe, please write in the space below:

____

____

____

This is the end of the questionnaire. Thank you for taking the time to fill it in.

Please now return the questionnaire in the freepost envelope provided.

Dr Denise Kendrick and Ms Alison Woods
214 Musters Road
West Bridgford
Nottingham NG2 7DR

Appendix D:

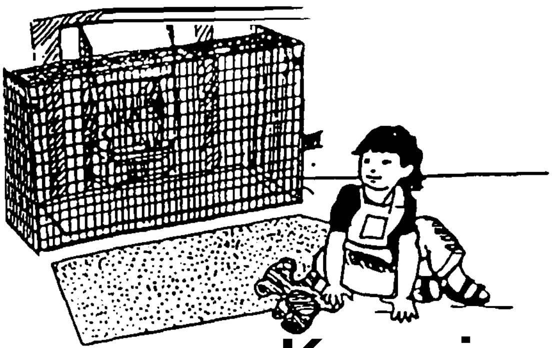
Table D1. Mean number of injuries occuring over a one year follow up period by risk and sociodemographic factors

Table D1. **Univariate** analyses of the mean number of injuries by risk and socio-demographic factors.

Risk or socio-demographic factor	No.	Mean no. of injuries	SD	t	df	p(2 tailed)
Male	292	1.06	0.28	-0.38	534	0.70
Female	246	1.06	0.22			
Age under 5 years	187	1.05	0.26	0.81	538	0.41
Age 5 years and over	353	1.07	0.24			
< 4 children in family	474	1.06	0.24	-0.96	72	0.34
≥ 4 children in family	62	1.10	0.30			
Ethnic group white	489	1.06	0.25	2.04	39	0.05
Ethnic group non white	22	1.02	0.09			
Single parent family	57	1.10	0.32	0.91	64	0.37
2 parent family	465	1.06	0.24			
No access to car	37	1.04	0.28	0.54	525	0.60
Access to car	490	1.07	0.25			
Owner occupier	466	1.06	0.25	0.03	526	0.98
Non owner occupier	62	1.06	0.25			
Receipt of benefits	79	1.07	0.31	0.22	96	0.83
No benefits received	445	1.06	0.24			
Maternal age ≤20	35	1.05	0.35	-2.60	468	0.01
Maternal age >20	435	1.10	0.25			
Unemployment	20	1.09	0.30	1.22	538	0.22
No unemployment	520	1.07	0.25			
Overcrowding	28	1.08	0.35	0.22	28	0.83
No overcrowding	511	1.06	0.24			
Resident in non deprived area	394	1.07	0.24	1.02	127	0.31
Resident in deprived area	97	1.04	0.30			
Previous injury	239	1.10	0.28	2.77	445	0.006
No previous injury	289	1.04	0.22			

Appendix £:

Questionnaires to assess knowledge, attitudes and practices in injury prevention for general practitioners, practice nurses and health visitors used in the study presented in chapter 4



Keeping Children Safe

FACULTY *of* MEDICINE

Department of General Practice

The Medical School
Queen's Medical Centre
Nottingham
NG7 2UH

Telephone
(0602) 70938[illegible]

Facsimile
(0602) 70938[illegible]

Dear Doctor

As you are aware accidental injuries are the most common cause of death in childhood and are also a cause of considerable morbidity. We are currently undertaking a study to assess the role of the primary health care team in this important health problem and we would be most grateful for your help with this.

Please help us by completing this brief questionnaire which should only take about 10 minutes of your time, returning it to us in the freepost envelope provided.

Free accident prevention workshops for primary healthcare team members are currently being organised to run between January and June 1994 and a free resource pack will also be available at the workshops. For further details please see attached flyer.

We would very much welcome your participation in the study . If you have any queries about the questionnaire or accident prevention in general please do not hesitate to contact either Dr.D.Kendrick on Nottingham (0602) 709301 or Ms.P.Marsh Nottingham 421421 Extension 41385.

We look forward to receiving your completed questionnaire.

Many thanks,

Yours sincerely,

Professor E.I.Williams Head of Department	Dr.D.Kendrick Lecturer in Public Health	P.Marsh Research Assistant	Trish Crowson Health Promotion Advisor

Childhood Accidental Injuries Questionnaire.

First some questions on what you think about accident prevention.

Please **indicate your agreement with the following statements on the scale below, by circling** the **number you most agree with.**

	Strongly agree 5	4	3	2	Strongly disagree 1
1. Most accidents are preventable	5	4	3	2	1
2. I believe GP's can be effective in preventing childhood accidents	5	4	3	2	1
3. Accident prevention is not a priority for me in child health care	5	4	3	2	1
4. Other members of the primary health care team have a greater responsibility for accident prevention than the GP	5	4	3	2	1
5. Accident prevention should be discussed in child health surveillance consultations	5	4	3	2	1
6. Discussing accident prevention is important in a consultation for an accidental injury	5	4	3	2	1
7. It is not appropriate for GP's to mention accident prevention during home visits	5	4	3	2	1
8. GP's should give first aid advice in consultations for acute accidental injury	5	4	3	2	1
9. Practices should routinely collect information on childhood accidents	5	4	3	2	1
10. GP's should be involved in lobbying or campaigning on local safety issues	5	4	3	2	1
11. It is important for practices to display posters and leaflets on accident prevention whenever possible	5	4	3	2	1
12. It is important for GP's to report concerns about child safety in individual families to other members of the primary care team	5	4	3	2	1

/

;e fill in the table below,and *tick only one* **box for** *each question* which corresponds most
;ly to your activity over the last 2 years.

	Always'	Often[2]	Sometimes[3]	Rarely'	Never[5]	Does not apply[6]
low often, if ever, do ı give advice about 3ty equipment in child ılth surveillance ıtacts such as contacts immunisation?						
·low often, If ever, do ı give advice about first in consultations for idental injury?						
·low often , if ever, do ı discuss how future ;idents can be vented when you see :hild following an ;idental injury?						
If you give advice ›ut safety equipment, v often, if ever, do you e advice about local ckists or local loan iemes?						
f you give advice)ut safety to parents, v often, if ever, do you o give the parents a ety leaflet?						

se **answer the following** questions by ticking **the relevant box:**
se tick ***only*** *one* ***box*** *per question*

	Yes	No	Don't know
The practice has analysed ıta on childrens accidents presenting the primary health care team in the st 2 years	☐ 1	☐ 2	☐ 3
Data on accidents to children has ten included in one of our practice ınual reports in the last 2 years	☐ 1	☐ 2	☐ :

	Yes	No	Don't know
I have worked with a local child safety oup within the last 2 years	☐ 1	☐ 2	☐ 3
I have lobbied or campaigned on local safety issue as an individual ithin the last 2 years	☐ 1	☐ 2	☐ 3
). I have attended a course or lecture on iild accident prevention in the last 2 years	☐ 1	☐ 2	☐ 3
f. Posters on child safety have been splayed in our waiting room within the last 2 ears	☐ 1	☐ 2	☐ 3

I have had contact with the following people about child safety in general, or about a specific child ie last 2 years:

*lease tick **one box** in each row*	Yes	No
Housing department	☐ 1	☐ 2
Environmental health	☐ 1	☐ 2
Road safety officer	☐ 1	☐ 2
Fire & Rescue Service	☐ 1	☐ 2
Ambulance service	☐ 1	☐ 2
Police	☐ 1	☐ 2
Community paediatrician	☐ 1	☐ 2
Health visitor	☐ 1	☐ 2
General practitioner	☐ 1	☐ 2
Local schools	☐ 1	☐ 2
Public health physician	☐ 1	☐ 2
Community development worker	☐ 1	☐ 2
FHSA Health promotion advisor	☐ 1	☐ 2
Health promotion officer from a Community Unit,Trust or DHA	☐ 1	☐ 2
Local child safety group	☐ 1	☐ 2
Voluntary organisation e.g. Red Cross. St Johns Ambulance	☐ 1	☐ 2

Other please specify ______________________________

)w some questions about accidental injuries.

Vhat is the most common cause of death in the UK in the following age groups?
ɜase tick one box in each column

	under 1 year	1 - 4 years	>=5 years
ıcer	☐ 1	☐ 2	☐ 3
.piratory disease	☐ 1	☐ 2	☐ 3
ıgenital abnormalities	☐ 1	☐ 2	☐ 3
;idents	☐ 1	☐ 2	☐ 3
deaths	☐ 1	☐ 2	☐ 3
Vt know	☐ 1	☐ 2	☐ 3

What is the trend in child accident death rates in the UK over the last 20 years?
iase tick one box only

reasing ☐ 1 steady ☐ 2 decreasing ☐ 3 don't know ☐ 4

Which type of accident causes the most fatalities for the ages shown?
ɜase tick one box per column

	under 1 year	1 -4 years	≥ 5 years
)wning	☐ 1	☐ 2	☐ 3
Jse fires	☐ 1	☐ 2	☐ 3
s	☐ 1	☐ 2	☐ 3
ısport	☐ 1	☐ 2	☐ 3
location	☐ 1	☐ 2	☐ 3
isoning	☐ 1	☐ 2	☐ 3
Vt know	☐ 1	☐ 2	☐ 3

What proportion of children attend an accident and emergency department each year as a result of an :ident? ***Please tick one box only***

n 20 ☐ 1 1 in 10 ☐ 2 1 in 6 ☐ 3 1 in 3 ☐ 4 don't know ☐ 5

What percentage of children attending an Accident and Emergency department following an accidental ıry are admitted to hospital? ***Please tick one box only***

2% ☐ 1 5 - 10% ☐ 10 - 20 % ☐ don't know ☐ 4 ch type only requires an attendance at the Accident and Emergency ment? *Please tick one box in each column*

	under 1 year	1 - 4 years	≥ 5 years
and scalds	☐ 1	☐ 2	☐ 3
	☐ 1	☐ 2	☐ 3
lings	☐ 1	☐ 2	☐ 3
ings	☐ 1	☐	☐ 3
l or piercing	☐ 1	☐	☐ 3
struck by objecV g object	☐ 1	☐ 2	☐ 3
now	☐ 1	☐ 2	☐ 3

ere do most fatal accidents take place? *Please tick one **box per** column*

	under 1 year	1 - 4 years	≥ 5 years
ne	☐ 1	☐ 2	☐ 3
caused by transport	☐ 1	☐ 2	☐ 3
know	☐ 1	☐ 2	☐ 3

girls have fewer or more accidents than boys? *Please tick one **box** only*

U' fewer ☐ 2 the same ☐ 3 don't know ☐ 4

children from families in social classes IV and V have fewer or more accidents than children from class I? ***Please tick one box only***

☐ fewer ☐ 2 the same ☐ 3 don't know ☐ 4

hich of the following are risk factors for childhood accidental injury?
e *tick **one box for each row***

	Is a risk factor	Is not **a** risk factor	Don't know
maternal age i.e. < 20 years	☐ 1	☐ 2	☐ 3
parent families	☐ 1	☐ 2	☐ 3
us accidental injury	☐ 1	☐ 2	☐ 3
ore children in family	☐ 1	☐ 2	☐ 3

0. Which of the following are risk factors for childhood accidental injury?
'lease tick one box for each row

	Is a risk factor	Is not a risk factor	Don't know
'oung maternal age i.e. < 20 years	☐ 1	☐ 2	☐ 3
;ingle parent families	☐ 1	☐ 2	☐ 3
'revious accidental injury	☐ 1	☐ 2	☐ 3
or more children in family	☐ 1	☐ 2	☐ 3
;ocio-economic deprivation	☐ 1	☐ 2	☐ 3
;tress in the family	☐ 1	☐ 2	☐ 3

\nd finally it would help us if you could answer some questions about 'ourself:

Your sex male ☐ 1 female ☐ 2

How old are you? <35 ☐ 1 35-44 ☐ 2 45-54 ☐ 3 55-64 ☐ 4 >=65 ☐ 5

How many partners are there in your practice including yourself?............partners

Approximately how many miles is it from your main surgery to the nearest A & E department? ≤1 ☐ 1 2-3 ☐ 2 4-5 ☐ 3 6-10 ☐ 4 >10 ☐ 5

Are you on the child health surveillance list?	Yes ☐ 1	No ☐ 2
Since qualifying, have you worked in hospital paediatrics, including as an SHO for at least 6 months?	Yes ☐ 1	No ☐ 2
Since qualifying, have you worked in community paediatrics, including as an SHO for at least 6 months?	Yes ☐ 1	No ☐ 2
Do you hold a higher qualification in paediatrics e.g.DCH, DCCH or MRCPaeds	Yes ☐ 1	No ☐ 2
Do you have any children, including adopted or step children?	Yes ☐ 1	No ☐ 2

If yexnave any o1 your chilaren under To attended an A & t department following an accidental injury?

Yes ☐[1] No ☐[2]
Don't know ☐[3] Not applicable ☐[4]

Have any of your children been admitted following an accident under the age of 16 years?

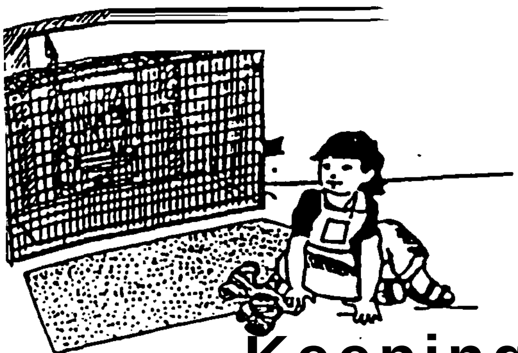
Yes ☐[1] No ☐[2]
Don't know ☐[3] Not applicable ☐[4]

(ou have any comments you would like to make about the questionnaire, !ase use the space below:

Very many thanks for your help

w please return the questionnaire in the reply paid envelope, or lo:

Ms. P. Marsh
Department of General Practice
University of Nottingham Medical School
Queens Medical Centre
Clifton Boulevard
Nottingham.NG7 2UH



Keeping Children Safe

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Department of General Practice

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Nottingham
NG? 2UH

Telephone
(0602) 709387

Facsimile
(0602) 709389

Dear Practice Nurse

As you are **aware** acddental injuries are the most common cause of death in childhood and are also a cause of considerable morbidity. We are currently undertaking a study to assess the role of the primary health care team in this important health problem and we would be most grateful for your help with this.

Please help us by completing this brief questionnaire which should only take about 10 minutes of your time, returning it to us in the freepost envelope provided.

Free accident prevention workshops for primary healthcare team members are currently being organised to run between January and June 1994 and a free resource pack will also be **available** at the workshops. For further details please see attached flyer.

We would very much welcome your participation in the study . If you have any queries about the questionnaire or accident prevention in general please do not hesitate to contact either Dr.D.Kendrick on Nottingham (0602) 709301 or Ms.P.Marsh Nottingham 421421 Extension 41385.

We look forward to receiving your completed questionnaire.

Many **thanks,**

Yours sincerely;

Dr.D.Kendrick Lecturer in Public Health	P.Marsh Research Assistant	Trish Crowson Health Promotion Advisor

dhood Accidental Injuries Questionnaire. ☐☐☐☐☐☐☐

some questions on what you think about accident preveniion.

e **Indicate your agreement with the following statements** on **the scale below,** by **circling** the er **you most agree with.**

	Strongly agree 5	4	3	2	Strongly disagree 1
St accidents are preventable	5	4	3	2	1
lieve practice nurses can be effective in nting childhood accidents	5	4	3	2	1
ident prevention is not a priority in child health care	5	4	3	2	1
er members of the primary health am have a greater responsibility ident prevention than the practice nurse	5	4	3	2	1
dent prevention should be discussed in ealth surveillance consultations	5	4	3	2	1
ussing accident prevention is important nsultation for an acute accidental injury	5	4	3	2	1
tice nurses should give first aid advice in ations for acute accidental injury	5	4	3	2	1
tices should routinely collect ition on childhood accidents	5	4	3	2	1
tice nurses should be involved in lobbying paigning on local safety issues	5	4	3	2	1
important for practices to posters and leaflets on accident ion whenever possible	5	4	3	2	1

·w some questions on your current accident prevention work.

ase tick the **box** that corresponds most closely to your activity over the last 2 years.

	Always'	Often[2]	Sometimes[3]	Rarely[4]	Never[5]	Does not apply[6]
, How often, If ever do you give dvice about safety equipment at ıe 8 month hearing test?						
1 How often, if ever do you lentify hazards in the home on ome visits and discuss them with le parents?						
I. How often, if ever, when dvising about safety equipment ɔ you give details of local ockists of safety equipment or cal loan schemes?						
If you give advice about safety)w often if ever do you also give ırents a safety leaflet?						
If you run a parents group e.g.)st-natal or mothers and ddlers, how often, if ever do you clude a session on preventing ccidents?						
. If you run a parents group e.g. ost-natal or mothers and oddlers, how often, if ever do you un a session on **first** aid?						
When you receive notification of child attending the A & E lepartment following an accident, ow often, if ever do you do a ome visit to discuss accident revention?						

ase answer the following questions by ticking the relevant box:
ase *tick only one box per question*

	Yes	No	Don't know
'have analysed data on accidents children on my caseload within the last ears	☐1	☐2	☐3

I have worked with a local child

ıave lobb ıafety iss ;t 2 years	Yes ☐ 1	No ☐ 2	Don't know ☐ 3
ıave attended a course or lecture on ıccident prevention within the last 2 years	☐ 1	☐ 2	☐ 3

flve had contact with the following people about childhood safety in general, or about a specfic child the last 2 years:

ıe tick one box in each row	Yes	No
Housing department	☐ 1	☐ 2
Environmental health	☐ 1	☐ 2
Road safety officer	☐ 1	☐ 2
Fire & Rescue Service	☐ 1	☐ 2
Ambulance service	☐ 1	☐ 2
Police	☐ 1	☐ 2
Community paediatrician	☐ 1	☐ 2
Health visitor	☐ 1	☐ 2
GP	☐ 1	☐ 2
Local schools or nurseries	☐ 1	☐ 2
Public health physician	☐ 1	☐ 2
Community development worker	☐ 1	☐ 2
FHSA health promotion advisor	D 1	☐ 2
Health promotion officer from the Community Unit, Trust or DHA	☐ 1	☐ 2
Local child safety group	☐ 1	☐ 2
Voluntary organisation e.g. Red Cross, St Johns Ambulance	☐ 1	☐ 2

Other please specify ______________________________

____

some ental Injuries

is the most common cause of death in the UK in the following age groups?
tick one box in each column

	under 1 year	1 - 4 years	≥ 5 years
	☐ 1	☐ 2	☐ 3
ory disease	☐ 1	☐ 2	☐ 3
ital abnormalities	☐ 1	☐ 2	☐ 3
ts	☐ 1	☐ 2	☐ 3
:hs	☐ 1	☐ 2	☐ 3
ow	☐ 1	☐ 2	☐ 3

is the trend in child accident death rates in the UK over the last 20 years?
tick only one box

ng ☐ 1 steady ☐ 2 decreasing ☐ 3 don't know ☐ 4

ı type of accident causes the most fatalities for the ages shown?
tick one box per column

	under 1 year	1 - 4 years	≥ 5 years
g	☐ 1	☐ 2	☐ 3
res	☐ 1	☐ 2	☐ 3
	☐ 1	☐ 2	☐ 3
1	☐ 1	☐ 2	☐ 3
ion	☐ 1	☐ 2	☐ 3
ıg	☐ 1	☐ 2	☐ 3
ıow	☐ 1	☐ 2	☐ 3

proportion of children attend an accident and emergency department each year as a result of an t? *Please tick one box only*

☐ 1 1 in 10 ☐ 2 1 in 6 ☐ 3 1 in 3 D 4 don't know ☐ 5

percentage of children attending an Accident and Emergency department are admitted to hospital sult of an accident? *Please tick one box only*

D 1 5 - 10% ☐ 10 - 20% ☐ 3 don't know ☐ 4 ich type of **home** accident most commonly require an attendance at the Accident and Emergency ment? ***~~Please tick onebox~~ -per column***

	under 1 year	1 - 4 years	≥5 years
and scalds	☐1	☐2	☐3
	☐1	☐2	☐3
ıing	☐1	☐2	☐3
ings	☐1	☐2	☐3
ȷ or piercing	☐1	☐2	☐3
struck by object/ g object	☐1	☐2	☐3
<now	☐1	☐2	☐3

ere do most fatal accidents take place? ***Please tick one box per column***

	under 1 year	1 - 4 years	≥ 5 years
ne	☐1	☐2	☐3
caused by transport	☐1	☐2	☐3
know	☐1	☐:	☐3

girls have fewer or more accidents than boys? ***Please tick one box only***

☐1 fewer ☐2 the same ☐3 don't know ☐4

children from families in social classes IV and V have fewer or more accidents than children from I class **I? *Please tick one box only***

D1 **fewer** ☐2 the same ☐3 don't know ☐4

/hich of the following are risk factors for childhood accidental injury?
*ɜe tick **one box in** each **row***

	Is a risk factor	Is not a risk factor	Don't know
g maternal age i.e. < 20 years	☐1	☐2	☐3
ə parent families	☐1	☐2	☐3
ous accidental injury	☐1	☐2	☐3
nore children in family	☐1	☐2	☐3
'•economic deprivation	☐1	☐2	☐3

	Is a risk factor	Is not a risk factor	Don't know
; in the family	☐ 1	☐ 2	☐ 3

finally it would help us if you could answer some questions about yourself:

Your sex   female ☐ 1 male ☐ 2

How old are you? < 35 ☐ 1 35-44 ☐ 2 45-54 ☐ 3 55-64 ☐ 4 >= 65 ☐ 5

How long have you been a health visitor? < 5 years ☐ 1 5 - 10 years ☐ 2 11 - 15 years ☐ 3 16-20 years ☐ 4 > 20 years ☐ 5

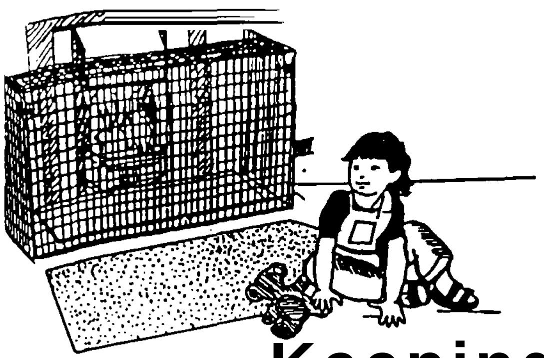
Are you a qualified children's nurse?	Yes ☐ 1	No ☐ 2
Have you worked as a school nurse for at least 6 months?	Yes ☐ 1	No ☐ 2
Have you worked as a practice nurse for at least 6 months?	Yes ☐ 1	No ☐ 2
Do you have any children, including adopted or step children?	Yes ☐ 1	No ☐ 2
If yes, have any of your children under 16 attended an A & E department following an accident?	Yes ☐ 1 Don't know ☐ 3	No ☐ 2 Not applicable ☐ 4
Have any of your children been admitted following an accident under the age of 16 years?	Yes ☐ 1 Don't know ☐ 3	No ☐ 2 Not applicable ☐ *

ou have any comments you would like to make about the questionnaire, please
the space below.

Many thanks for your help

please return the questionnaire in the reply paid envelope, or send to:

Ms. P. Marsh
Department of General Practice
University of Nottingham Medical School
Queens Medical Centre
Clifton Boulevard
Nottingham NG7 2UH



Keeping Children Safe

FACULTY *of* MEDICINE

Department of General Practice

The Medical School
Queen's
Medical Centre
Nottingham
NG7 2UH

Telephone
(0602) 709387

Facsimile
(0602) 709389

Dear Health Visitor

As you are aware accidental injuries are the most common cause of death in childhood and are also a cause of considerable morbidity. We are currently undertaking a study to assess the role of the primary health care team in this important health problem and we would be most grateful for your help with this.

Please help us by completing this brief questioimaire which should only take about <u>10 minutes</u> of your time, returning it to us in the freepost envelope provided.

Free accident prevention workshops for primary healthcare team members are currently being organised to run between January and June 1994 and a free resource pack will also be available at the workshops. For further details please see attached flyer.

We would very much welcome your participation in the study . If you have any queries about the questionnaire or accident prevention in general please do not hesitate to contact either Dr.D.Kendrick on Nottingham (0602) 709301 or Ms.P.Marsh Nottingham 421421 Extension 41385.

We look forward to receiving your completed questionnaire.

Many thanks,

Yours sincerely,

Dr.D.Kendrick
Lecturer in
Public Health

Maureen Morgan
Assistant Director of
Primary Care

P.Marsh
Research
Assistant

dhood Accidental Injuries Questionnaire. D D D □ D D D

some questions on what you think about accident prevention.

indicate your agreement with the following statements on the scale below, by circling the r you most agree with.

	Strongly agree 5	4	3	2	Strongly disagree 1
t accidents are preventable	5	4	3	2	1
ieve health visitors can be e in preventing childhood accidents	5	4	3	2	1
dent prevention is not a priority in child health care	5	4	3	2	1
r members of the primary health care ave a greater responsibility for t prevention than the health visitor	5	4	3	2	1
dent prevention should be discussed in ealth surveillance consultations	5	4	3	2	1
e visits provide a good opportunity ify and discuss hazards in the home	5	4	3	2	1
ications from the liaison health visitor at re useful for building up a picture of the cident problem	5	4	3	2	1
til visitors should be involved in or campaigning on local safety issues	5	4	3	2	1
important for practices to posters and leaflets on accident ion whenever possible	5	4	3	2	1
ents groups such as mother & toddler or tal groups provide a good opportunity for lth visitor to teach first aid	5	4	3	2	1
important for health visitors to te post accident follow up visits to accident prevention	5	4	3	2	1
not appropriate for health visitors to do afety checks to identify hazards	5	4	3	2	1

v some questions on your current accident prevention work.

se tick the box that corresponds most closely to your activity over the last 2 years.

	Always[1]	Often[2]	Sometimes[3]	Rarely[4]	Never[5]	Does not apply[6]
How often, if ever do you give vice about safety equipment at \ 8 month hearing test?						
How often, if ever do you ntify hazards in the home on me visits and discuss them with parents?						
How often, if ever, when vising about safety equipment you give details of local ckists of safety equipment or al loan schemes?						
If you give advice about safety w often if ever do you also give rents a safety leaflet?						
Il you run a parents group e.g. st-natal or mothers and ldlers, how often, if ever do you lude a session on preventing cidents?						
If you run a parents group e.g. st-natal or mothers and ldlers, how often, if ever do you a session on first aid?						
When you receive notification of child attending the A & E partment following an accident, w often, if ever do you do a me visit to discuss accident evention?						

ase answer **the following questions by ticking** the relevant box:

ase *tick **only** one **box per** question*

	Yes	No	Don't know
have analysed data on accidents hildren on my caseload within the last ars	☐ 1	☐ 2	☐ 3
have worked with a local child ty grou	☐ 1	☐ 2	☐ 3

	Yes	No	Don't know
ave lobbied or campaigned on a afety issue as an individual within t 2 years	☐ 1	☐ 2	☐ 3
ave attended a course or lecture on ccident prevention within the last 2 years	☐ 1	☐ 2	☐ 3

ave had contact with the following people about childhood safety in general, or about a specfic child the last 2 years:

e tick one box in each row	Yes	No
Housing department	☐ 1	☐ 2
Environmental health	☐ 1	☐ 2
Road safety officer	☐ 1	☐ 2
Fire & Rescue Service	☐ 1	☐ 2
Ambulance service	☐ 1	☐ 2
Police	☐ 1	☐ 2
Community paediatrician	☐ 1	☐ 2
Health visitor	☐ 1	☐ 2
GP	☐ 1	☐ 2
Local schools or nurseries	☐ 1	☐ 2
Public health physician	☐ 1	☐ 2
Community development worker	☐ 1	☐ 2
FHSA health promotion advisor	☐ 1	☐ 2
Health promotion officer from the Community Unit, Trust or DHA	☐ 1	☐ 2
Local child safety group	☐ 1	☐ 2
Voluntary organisation e.g. Red Cross, St Johns Ambulance	☐ 1	☐ 2

Other please specify ______________________________

____

/ some questions about accidental injuries

at is the most common cause of death in the UK in the following age groups?
se *tick one **box** in each **column***

	under 1 year	1 - 4 years	≥ 5 years
er	☐ 1	☐ 2	☐ 3
jatory disease	☐ 1	☐ 2	☐ 3
enital abnormalities	☐ 1	☐ 2	☐ 3
ents	☐ 1	☐ 2	☐ 3
eaths	☐ 1	☐ 2	☐ 3
know	☐ 1	☐ 2	☐ 3

iat is the trend in child accident death rates in the UK over the last 20 years?
*e tick **only one box***

ising ☐ 1 steady ☐ 2 decreasing ☐ 3 don't know ☐ 4

iich type of accident causes the most fatalities for the ages shown?
*e tick one **box per** column*

	under 1 year	1 - 4 years	≥ 5 years
ling	☐ 1	☐ 2	☐ 3
fires	☐ 1	☐ 2	☐ 3
	☐ 1	☐ 2	☐ 3
)ort	☐ 1	☐ 2	☐ 3
lation	☐ 1	☐ 2	☐ 3
ing	☐ 1	☐ 2	☐ 3
know	☐ 1	☐ 2	☐ 3

at proportion of children attend an accident and emergency department each year as a result of an int? ***Please tick one box** only*

) ☐ 1 1 in 10 ☐ 2 1 in 6 ☐ 3 1 in 3 ☐ 4 don't know ☐ 5

t percentage of children attending an Accident and Emergency department are admitted to hospital sult of an accident? ***Please tick one box only***

☐ 1 5 - 10% ☐ 10-20% ☐ don't know ☐ 4

ch type of home accident most commonly require an attendance at the Accident and Emergency ment? *Please tick one box per column*

	under 1 year	1 - 4 years	≥ 5 years
and scalds	☐ 1	☐ 2	☐ 3
	☐ 1	☐ 2	☐ 3
ling	☐ 1	☐ 2	☐ 3
lings	☐ 1	☐ 2	☐ 3
or piercing	☐ 1	☐ 2	☐ 3
struck by objecV g object	☐ 1	☐ 2	☐ 3
Know	☐ 1	☐ 2	☐ 3

ere do most fatal accidents take place? ***Please tick** one **box per column***

	under 1 year	1 - 4 years	≥ 5 years
ne	☐ 1	☐ 2	☐ 3
caused by transport	☐ 1	☐ 2	☐ 3
(now	☐ 1	☐ 2	☐ 3

girls have fewer or more accidents than boys? ***Please tick one box only***

☐ 1 fewer ☐ 2 the same ☐ 3 don't know ☐ 4

children from families in social classes IV and V have fewer or more accidents than children from class I? ***Please tick one box only***

☐ 1 fewer ☐ 2 the same ☐ 3 don't know ☐ 4

hich of the following are risk factors for childhood accidental injury?
*'e tick **one box in each row***

	Is a risk factor	Is not a risk factor	Don't know
maternal age i.e. < 20 years	☐ 1	☐ 2	☐ 3
parent families	☐ 1	☐ 2	☐ 3
ous accidental injury	☐ 1	☐ 2	☐ 3
nore children in family	☐ 1	☐ 2	☐ 3
-economic deprivation	☐ 1	☐ 2	☐ 3

	is a risk factor	Is not a risk factor	Don't know
s in the family	☐ 1	☐ 2	☐ 3

finally it would help us if you could answer some questions about yourself:

Your sex female ☐ 1 male ☐ 2

How old are you? < 35 ☐ 1 35-44 ☐ 2 45-54 ☐ 3 55-64 ☐ 4 >= 65 ☐ 5

How long have you been
a health visitor? < 5 years ☐ 1 5-10 years ☐ 2 11 - 15 years ☐ 3
16-20 years ☐ 4 > 20 years ☐ 5

Are you a qualified children's nurse?	Yes ☐ 1	No ☐ 2
Have you worked as a school nurse for at least 6 months?	Yes ☐ 1	No ☐ 2
Have you worked as a practice nurse for at least 6 months?	Yes ☐ 1	No ☐ 2
Do you have any children, including adopted or step children?	Yes ☐ 1	No ☐ 2
If yes, have any of your children under 16 attended an A & E department following an accident?	Yes ☐ 1 Don't know ☐ 3	No ☐ 2 Not applicable ☐ 4
Have any of your children been admitted following an accident under the age of 16 years?	Yes ☐ 1 Don't know ☐ 3	No ☐ 2 Not applicable ☐ 4

ou have any comments you would like to make about the questionnaire, please e the space below:

Many thanks for your help

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Appendix F:

Figures F1-F3. Scatter plots of scores for knowledge of childhood unintentional injury epidemiology against scores for attitude towards injury prevention for general practitioners, practice nurses and health visitors

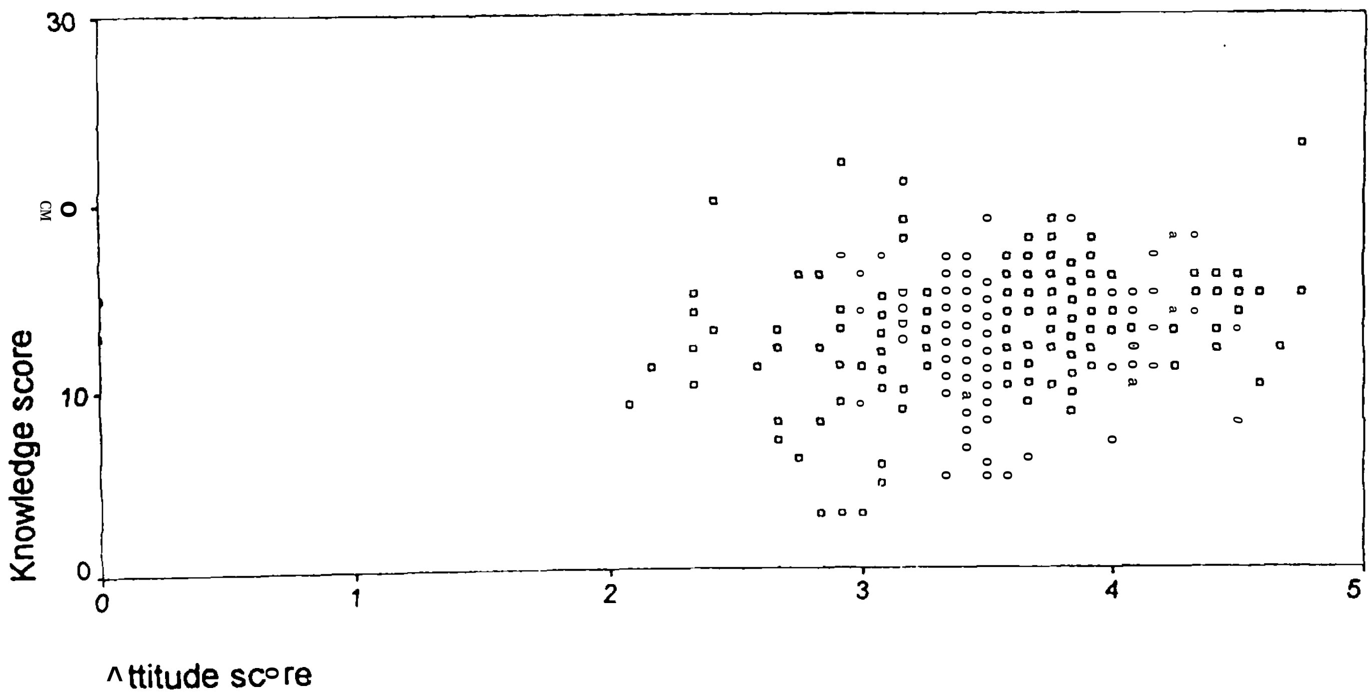

Figure F1. Scatter plot of score of fr[redacted] ge of unintentional injury epidemiology against score of attitude towards unintentional injury prevention among general practitioners.

Figure F2. Scatter plot of score of knowledge of unintentional injury epidemiology against score of attitude towards unintentional injury prevention for practice nurses.

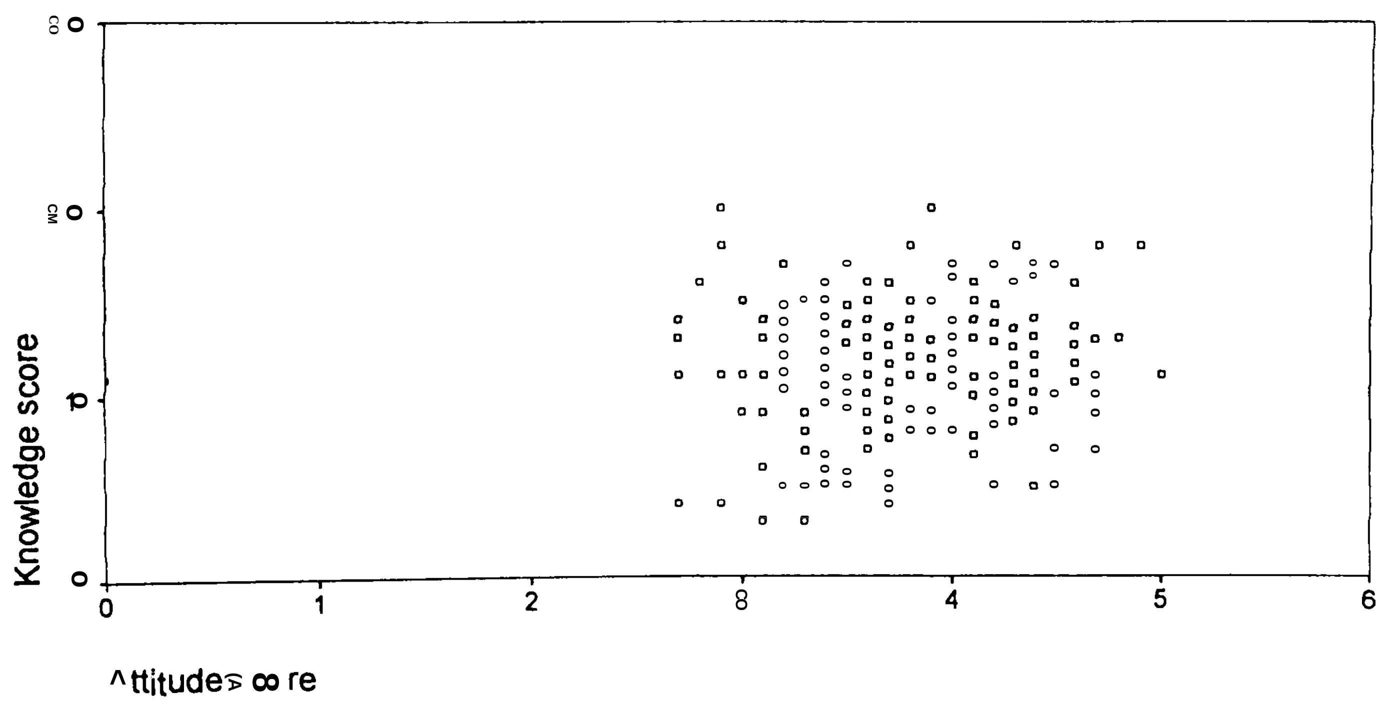

Figure F3. Scatter plot of score of knowledge of unintentional injury epidemiology against score of attitude towards unintentional injury prevention for health visitors