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ACCIDENTS IN CHILDHOOD

During the last 30 years the proportion of deaths occurring in childhood caused by accidents has risen from 21 to 30 per cent. This development is not, however, as disturbing as it might initially appear for it is more a reflection of the elimination of infectious diseases from childhood mortality patterns than an indication of trends in accidental fatalities. Over this period the latter have fallen, both in volume terms and as rates per million population aged 1-14 years, by between 40 and 50 per cent. Furthermore, the performance of England and Wales in this particular area is currently one of the best in the world (Figure 1).

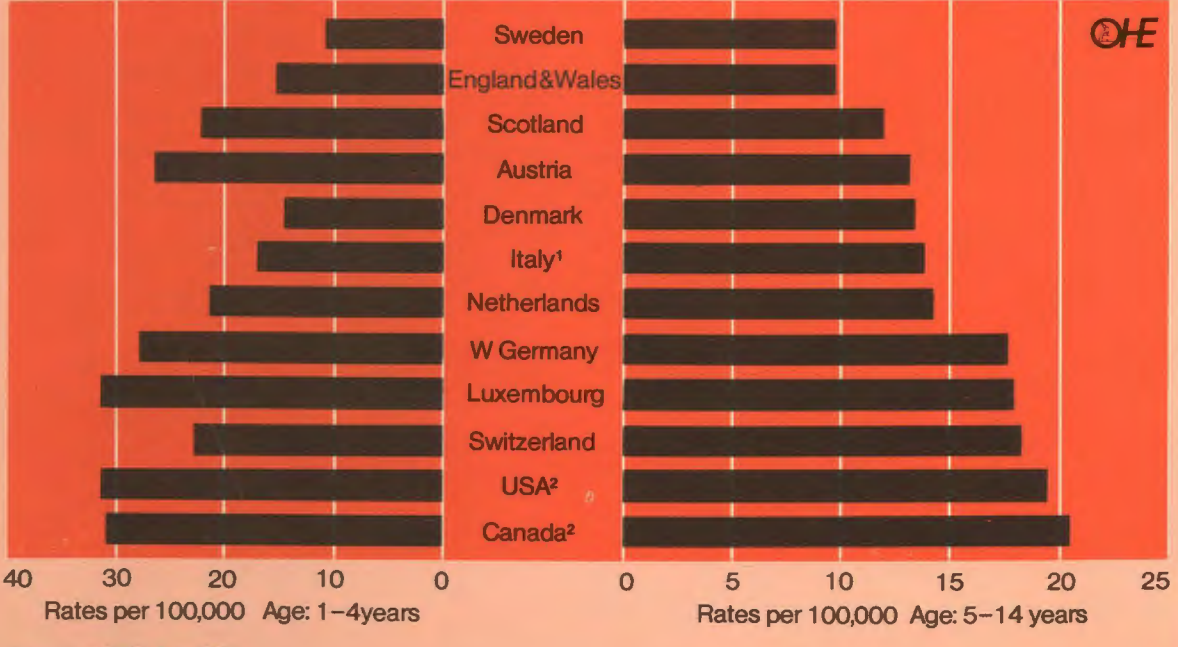
Yet fatalities represent only the tip of the iceberg of injuries sustained accidentally by children each year. This point has emerged clearly from several local investigations carried out since the Court Report's comment in the mid-1970s that 'the extent of non-fatal accidents is unknown and the professional time spent in treating them unmeasured'. This Briefing draws together some of these findings and attempts to quantify the magnitude and economic costs of the problem from a national point of view. It also reviews recent trends in both fatal and non-fatal accidents and examines the prospects for successful preventive action.

Numbers and costs

In 1979 in England and Wales 925 children (boys outnumbering girls 2.27 to 1) aged between one and fourteen years died as a result of the injuries they had sustained accidentally. Although this total represented only slightly in excess of six per cent of all accidental deaths in that year, the latter constitute a significant element in current childhood mortality patterns.[1] Thus

1. In 1979, 201 infants aged under one year died accidentally, most (70 per cent) through choking on food or by suffocation. However, these deaths represent just 3 per cent of infant mortality and will not receive further consideration in this Briefing.

Figure 1 *Deaths from Accidents, Poisonings and Violence among children aged 1-4 and 5-14 years in 1978, selected countries, rates per 100,000 population*



Notes: 1 = 1975; 2 = 1977

Source: World Health Organisation–vital statistics and causes of death, 1980

between the ages of one and four years accidents are responsible for 22 per cent of deaths whilst the corresponding proportion for both 5-9 and 10-14 age groups is 34 per cent (1979 data). For all children aged 1-14 years accidents account for 30 per cent of fatalities and are the most common cause of death.

Table 1 outlines the principal types of accidental death among children. Overall the four broad categories described account for 84 per cent of accidental fatalities in childhood although this obviously disguises some important age/type of accident relationships. The 'others' category embraces a broad range of misadventures including poisoning by drugs, medicaments and biologicals. The latter resulted, however, in just five deaths in 1979 (that is, half of one per cent of all accidental deaths in children aged 1-14 years). Poisoning fatalities from other sources were more than three times this number.

Fatalities represent only a very small fraction of the overall toll of childhood accidents. Many hundreds of thousands more seek treatment each year for a diverse range of injuries. At the more severe end of the spectrum, it may be estimated from the Hospital Inpatient Enquiry (HIPE) that accidents caused nearly 128,000 children aged 1-14 years to be admitted to hospital as inpatients in England and Wales in 1977. This figure is equivalent to approximately one quarter of all injuries at all ages (including those non-accidentally inflicted) treated in hospital each year.

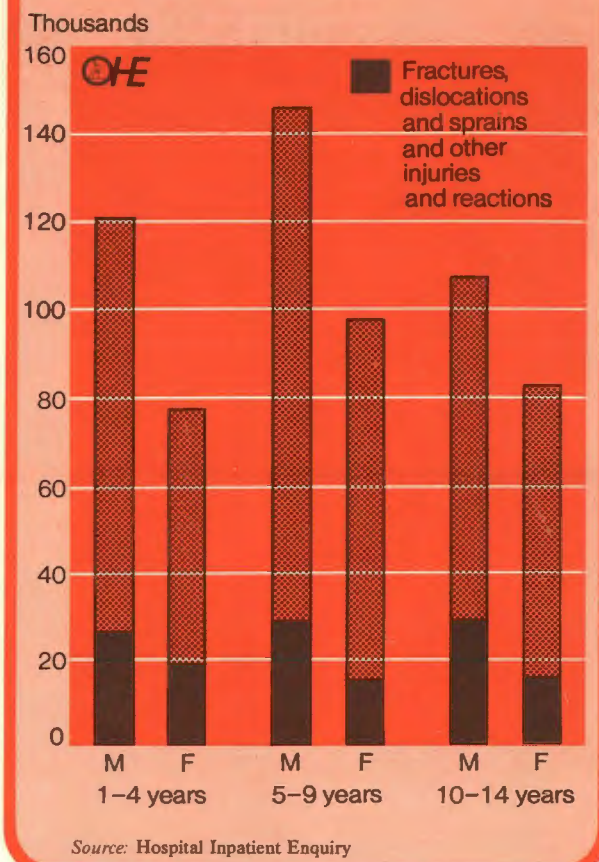
The data collected by the Hospital Inpatient Enquiry show–very broadly–where the accidents giving rise to admission took place. Of the 128,000 cases admitted in 1977, nearly 11 per cent were the result of road accidents and in excess of 20 per cent occurred in the home. Unfortunately, the remaining 69 per cent were unclassified. Nevertheless some important characteristics of accidents in childhood may be extracted from the available data. First, 86 per cent of childhood road accidents involved those aged 5-14 years, with boys outnumbering girls by 2 to 1 for all the years of childhood taken together. Conversely, 63 per cent of the home accidents happened to children aged 1-4 years and overall the boy : girl ratio was smaller at 1.5 to 1. Second, intracranial damage accounted for 55 per cent of road accident injuries to children with a further 19 per cent attributable to fractures of the lower limb. In home accidents poisoning accounted for 29 per cent, intracranial injury for 27 per cent and burns for 14 per cent. Finally, among the 'unspecified' accidents–71 per cent of which occur at or after the age of 5 years–the principal injuries are intracranial damage (37 per cent) and poisoning (18 per cent).

Employing the two HIPE classifications of (a) fractures, dislocations and sprains and (b) other injuries and reactions together as a measure of inpatient treated accident cases[2] indicates that such injuries accounted for 21 per cent of all childhood admissions in 1977. This average figure spanned a high of 27 per cent for boys aged 10-14 years and a low of 16 per cent for girls between the ages of 5 and 9 years (Figure 2). It may also be calculated from the diagram that the ratio of male to female admissions for accidents increases with age–from 1.45 to 1 at ages 1-4 years to 1.85 to 1 at 10-14 years. Conversely, the ratio for non-accident admissions declines from 1.60 to 1 to 1.17 to 1 at the corresponding ages.

In sharp contrast to the above, it is considerably more difficult to derive an accurate figure for the numbers of children seeking medical attention for accidental injury but not requiring inpatient admission. There is, for example, no routine collection of data showing attendances at Accident and Emergency (A & E) departments and measures that do exists are often restricted to specific areas of interest. In the latter context the relatively recent introduction of the Home Accident Surveillance System may be noted. The report covering its

2. This procedure is adopted in order to obtain a more detailed age breakdown and appears to involve negligible loss of accuracy since injuries actually designated by HIPE as accidents account for 98 per cent of the total included in the two classifications specified in the text.

Figure 2 *Discharges from and deaths in hospital: all causes and fractures, sprains and other injuries, children aged 1-4, 5-9 and 10-14 years, 1977, England and Wales, thousands*



Source: Hospital Inpatient Enquiry

Table 1 *Causes of accidental death in childhood in 1979, England and Wales, percentages*

Accident	*Age group*		
	1-4	*5-9*	*10-14*
Motor vehicle traffic accidents	38.4	61.9	58.6
–Collision with pedestrian	(29.8)	(50.8)	(29.5)
–Collision with pedal cyclist	(0.4)	(4.8)	(22.3)
Falls	6.6	3.9	4.5
Fire and Flames	16.7	6.0	6.0
Drowning, submersion, suffocation	19.8	17.2	10.7
Others	18.6	10.9	20.2
	100	100	100
Number of deaths	258	331	336

Source: Office of Population Censuses and Surveys

third year of operation suggests that some 325,000 cases aged 0-14 years were seen at A & E departments in England and Wales in 1979 as a result of injuries sustained in or around the home (Department of Trade 1980). Overall estimates may nevertheless be calculated from a number of sources.

In 1960 a special survey was undertaken of all hospital A & E departments in England and Wales (CHSC 1962). It was found that during one week in October 23,569 children under 15 years were seen as new outpatients in these departments. Scaling up to an annual value and then inflating on the assumption that child accident cases have increased to the same extent as all new A & E attendances (76 per cent between 1960 and 1979) generates a figure of approximately 2.16 million new A & E cases per annum for the late 1970s.

An alternative approach might be to extrapolate the findings of more recent local studies to provide national estimates. From the records of attendances at the A & E department of Warwick hospital in 1980, Avery (1981) has calculated that 5.5 per cent of cases involving children aged 1-14 years require admission either for treatment or observation. Used in conjunction with the inpatient population indicated by HIPE this proportion suggests an annual A & E attendance figure for children of 2.33 million.

This level of demand has been validated by other local studies. Thus Illingworth (1977) found that approximately one child in six in Sheffield attended the A & E department of the Children's Hospital in 1975. Sibert and his colleagues (1981) suggested from their study in South Glamorgan that 20 per cent of the child population each year might be expected to attend hospital following accidents. On this basis 2.1 million such attendances would have occurred in England and Wales in 1979. This figure is equivalent to slightly more than one-fifth of the officially recorded all ages total in 1979.[3] This proportion in turn has been reproduced by independent studies of the workload of A& E departments in major hospitals in Leeds (Leeds Western Health District 1977) and Canterbury (Calnan 1979).

Inevitably discrepancies exist between samples in terms of the population investigated, the definitions employed and the methodology adopted but it would seem reasonable to postulate that accidental injuries sustained by children aged 1-14 currently result in approximately two million attendances at A & E departments each year. Sibert and his colleagues (1981) suggest that given the profile of injuries exhibited by their sample (Figure 3) approaching three quarters of cases require only simple investigation and/or treatment or just reassurance. Inpatient admission has generally been found necessary in just five or six per cent of cases.

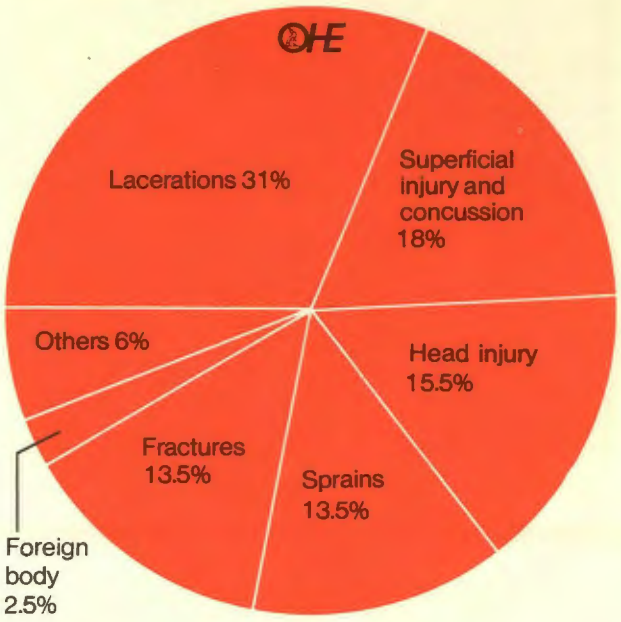
Medical assistance for accidents to children is also sought from general practitioners but here too the data are incomplete. The principal source of available information is the Second National Survey of Morbidity in General Practice which was carried out in 1970/71. Applying the observed consultation rates to the 1979 population indicates that perhaps 860,000 children (that is, one child in every 12) aged 0-14 years currently visit their GPs at least once over a twelve month period as a consequence of accidents, poisoning or violence.

Inevitably, the GP help-seekers will overlap to some extent with those recorded in the hospital sector. Thus the Second Morbidity Survey indicated that GPs refer nearly 18 per cent of all persons consulting for accidents—principally to outpatients or for investigative procedures. With regard to referrals in the opposite direction, it has been estimated that 33 per cent of consultations (all ages) with GPs for home accidents have received initial treatment at a hospital (Hesketh and Whittington 1976). If it is assumed that his proportion is valid for accidents occurring in all locations as well as for children under 15 years of age then it may be concluded that approximately half of the 1.33 million GP consultations by children for accidents, poisonings and violence each year are successfully treated without any involvement of the hospital services.

Table 2 summarises the overall burden of accidents occuring in childhood. The costs of medical care—estimated in £ December 1980 at almost £70 million—can only be regarded as very crude orders of magnitude; no account has been taken, for example, of the costs of follow-up outpatient care nor of the use made of the ambulance services. Furthermore, the conceptual and methodological difficulties of evaluating the economic, social and other losses generated by the accidental death of a child have prohibited the inclusion of any such values in this Briefing. However, given current life expectancies, it may be estimated that the 642 male and 283 female accidental fatalities in 1979 cost some 60,000 years of potential life.

3 There were 9.731 million new A & E attendances in England and Wales in 1979 (DHSS unpublished data.)

Figure 3 *Types of injury sustained by children presenting for Accident and Emergency care in South Glamorgan*



Source: Sibert et al 1981

Table 2 *The numbers and estimated costs of accidents in childhood in England and Wales*

	Number	*Cost £ million (Dec 1980)*
Deaths (1979)	925	—
Hospital Inpatients (1977)	128,000	31.1
New A & E cases (1979)	2,000,000	31.4
GP consultations (1979)	1,334,000	5.5
		68.0

Source: OHE Estimates

One other cost that remains unquantified is that arising from the permanent impairments and handicaps caused by accidental injury. Once again there is a dearth of information. At the most fundamental level variations in definitions, among other factors, mean that there is little consistency in reported morbidity rates from which impairment ratios might be calculated. Thus the Bristol-based 'Child Health and Education in the Seventies' project suggests that almost 44 per cent of children have been injured by their fifth birthday (Butler 1980) while the National Child Development Study found that only 29 per cent had been accidentally injured by the age of 11 years (Calnan and Wadsworth 1977).

A major survey of disablement in Britain was undertaken in 1969 (Harris et al 1971) but its attention was confined to the adult population living outside residential institutions. Where the prevalence of disabilities in children under 15 years has been investigated, either in studies concerned specifically with this age group or in those covering persons of all ages, the numbers stemming from accidental injury have generally been found to be so small that extrapolations to national levels would be extremely hazardous (for examples see Gaffin 1980). A recent special analysis of data contained in the General Household Survey for 1974 has, however, thrown some light on this particular area (Weale and Bradshaw 1981).

Long standing illness, disability or infirmity were found in 633 of the 8,292 children under 16 years included in the survey, a prevalence rate of 76 per 1000 population. Within the former total 10 per cent were regarded as severely affected and 28 per cent and 62 per cent respectively as moderately and mildly disabled.

Accidents, poisonings and violence did not contribute to the severe classification and constituted just 4 per cent of the moderate and 2 per cent of the mild categories. The data therefore suggest that there are possibly 9,500 moderately and 11,000 mildly disabled children under 16 years in England and Wales whose impairments are the result of accidental injury.[4] These figures should only be seen as crude approximations; clearly there is considerable scope for further research both into the numbers involved and, more importantly, into the extent and nature of associated handicaps.

Recent trends

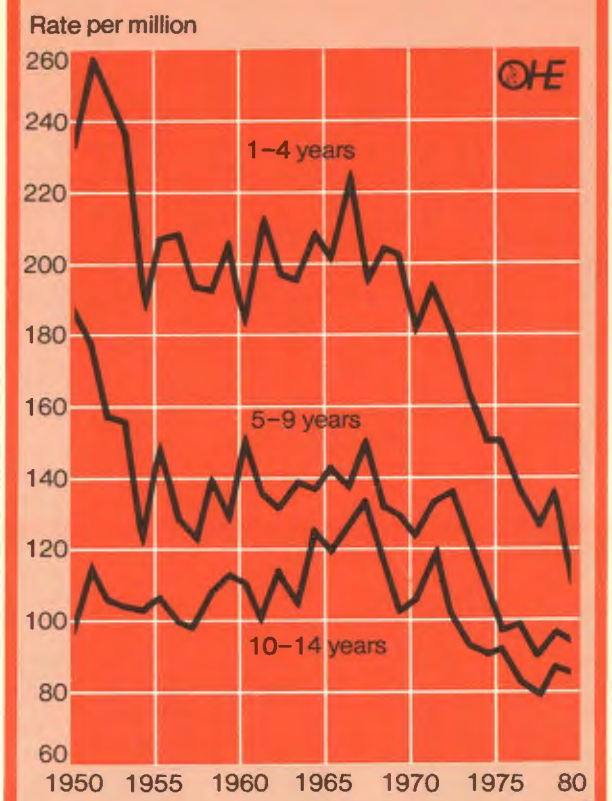
The incomplete nature of the available data sources noted in the foregoing section means that time series analyses are feasible only for the more severe accidental childhood injuries brought to medical attention—that is, those resulting in hospital admission or death. Broadly, these two measures have moved in opposite directions over the past twenty years.

Figure 4 shows trends in accidental fatalities among children of various ages between 1950 and 1979. It is clear that the most substantial improvement has occurred in the 1-4 year age grouping. Confining attention to the post 1960s era and employing averages in order to diminish the distortions arising from sharp year-on-year fluctuations, it may be calculated that the accidental death rate for the youngest group fell by nearly 37 per cent between 1960/61 and 1978/79. Table 3 indicates that falls in the fatality rates for motor vehicle traffic accidents (35 per cent) and for drowning (53 per cent) together accounted for 61 per cent of the total decline in accidental deaths in this age group. The reductions in the death rates for those aged 5-9 and 10-14 years were less substantial—33 and 19 per cent respectively.

Mortality statistics need to be treated with caution. At high levels of aggregation they disguise important variations by age and type of accident as well as by sex and social class. More technically, some fatalities recorded as accidents may in fact be unrecognised cot deaths, homicides or, among 10-14 year olds, suicides. (In 1979 the last two categories together contained 65 deaths, equivalent to 7 per cent of childhood accidents in that year). Conversely, the official accident toll may be an underestimate in that 47 deaths were assigned to the ICD classification, introduced in the late 1960s, 'fatal injury, undetermined whether accidentally or purposely inflicted'. Finally, mortality data employed in isolation may create a misleading impression of overall trends. As Backett (1980) has emphasised declining case fatality rates may conceal the survival of an increasing number of disabled and handicapped people.

In spite of these comments there have clearly been

Figure 4 *Accidental deaths in childhood: rates per million children aged 1-4, 5-9 and 10-14 years, 1950-1979, England and Wales*



Source: Office of Population Censuses and Surveys

improvements in accidental death rates among children over the past two or three decades—a general pattern unmatched by injuries requiring admission to hospital. Table 4 shows trends in admissions for various types of accidental injury from the beginning of the 1960s to the late 1970s. Among children aged 0-4 years the overall admission rate per 10,000 population has risen by 85 per cent. More specifically, the rate for poisoning has more than trebled and that for head injuries (fractures and intracranial injury) has almost doubled. Poisoning now accounts for 37 per cent of admissions compared to 22 per cent at the beginning of the period.[5]

Among children aged 5-14 years admissions grew by 39 per cent over the period. Head injuries, always the major cause of inpatient admission, have become more significant over time and now account for 45 per cent of

4 It should not be implied from this study that childhood accidents do not result in severe impairments. Jennett (1973), for example, has suggested that between 1,000 and 1,500 children leaving hospital each year following head injury are likely to develop late traumatic epilepsy. And Jemison and Kaye (1974) have estimated that 1.5 per cent of children suffering similar injuries will be left with residual neurological deficit.

5. Over the period 1969-76, medicinal products accounted for 65.3 per cent of inpatient poisoning cases among children aged 0-14 years (McLean 1980). In 1977 the corresponding proportion had fallen to 62.4 per cent.

Table 3 *Accidental deaths by selected cause: average rates per million population aged 1-4, 5-9 and 10-14 years, 1960/1 and 1978/79, England and Wales*

Accident	*Age Group*					
	1-4		*5-9*		*10-14*	
	1960/61	*1978/79*	*1960/61*	*1978/79*	*1960/61*	*1978/79*
Motor vehicle traffic accident	72.7	47.3	71.5	61.1	46.9	53.6
Falls	13.7	8.1	6.0	3.6	7.8	3.7
Fire	19.4	20.2	8.9	5.5	3.3	3.9
Drowning	35.2	16.6	32.6	12.7	19.2	4.3
Suffocation	3.2	6.4	0.6	1.7	0.8	4.4
All causes	195.8	123.5	141.9	94.5	104.5	85.1

Source: Office of Population Censuses and Surveys

Table 4 *Hospital discharges and deaths for selected injuries and reactions: average rates per 10,000 population aged 0-4 years and 5-14 years, 1961-63, 1968-70 and 1975-77, England and Wales*

	Head injuries	*Other fractures and dislocations*	*Burns*	*Poisoning*	*All injuries*
0-4 years					
1961-63	28.2	9.9	14.5	20.8	95.4
1968-70	44.1	12.2	13.2	56.0	152.5
1975-77	52.5	12.8	13.4	64.9	176.2
5-14 years					
1961-63	30.2	22.4	3.5	1.9	81.6
1968-70	40.3	24.6	3.0	5.1	99.4
1975-77	50.5	27.3	2.4	7.9	113.1

Source: Hospital Inpatient Enquiry

cases. A further 24 per cent stem from various fractures (excluding the head) and dislocations.

As with mortality statistics care must be exercised in interpreting data from the Hospital Inpatient Enquiry. Attendance at A & E departments and inpatient admission may be a function of non-medical as well as medical factors and some groups have been shown to seek treatment less readily than others. The HIPE derived population may not therefore be perfectly representative of the true incidence of certain types or degrees of injury. In addition HIPE does not differentiate between cases detained for observation and those admitted for treatment. Sibert and his colleagues (1981) reported that the former was the reason for admission in three cases out of four in their sample. This distinction is particularly relevant in context of head injuries and poisoning.[6]

Trend analysis is further constrained by the difficulties of measuring changes in the extent to which children are at risk from accidents. Calnan and Wadsworth (1977) have pointed out that 'whereas it can be said of pilots that, for example, hours of flying and numbers of particular manoeuvres can be seen as quantifying 'at-riskness', in studies of children there is no comparable measure'.

Finally, the data shown in Table 4 are averages. Figure 5 paints a more optimistic picture. Although it confirms that accident admission rates for both sexes aged 1-14 years were higher in 1978 than in 1968 it also indicates that an uninterrupted decline has been in progress since 1975 for males and since 1976 for females. More detailed analysis shows that almost two-fifths of the total (i.e. all injuries) decline observed for all children under 15 years between 1975 and 1978 can be attributed to a reduction in the number of poisoning cases aged 0-4 years alone.

Future Prospects

Falls in mortality and hospital admission rates for childhood accidents in recent years suggest that there might be scope for continued improvement. Support for this contention may be derived from the widely varying regional and social class rates found for accidental injury. Table 5 indicates that the difference between the highest and lowest regional accident fatality rates is equivalent to 46 per cent of the overall average for England and Wales. Focusing on hospital admissions the corresponding proportions are 58 per cent for children aged 0-4 and 36 per cent for those between the ages of 5 and 14 years.

Figure 6 shows standardised mortality ratios (SMRs) of deaths of boys aged 1-14 years in each of the Registrar

6. In England and Wales cases of poisoning admitted to hospital among children aged 0-4 years increased from 13,600 in 1965 to 23,700 in 1975 and thereby accounted for 61 per cent of the increase in admissions for all injuries at these ages. At least some of this increase may be accounted for by a new policy implemented in the mid/late 1960s whereby poisoning cases were admitted for observation (MacFarlane and Fox 1978). The drop in the mean length of stay for poisoning cases aged 0-4 years from 2.3 to 1.5 days over the same period would be consistent with this hypothesis.

Figure 5 *Discharges from and deaths in hospital due to fractures, dislocations and sprains and other injuries and reactions, children aged 1-14 years, 1968-78, England and Wales, rates per 10,000 population*

Source: Hospital Inpatient Enquiry

Table 5 *Childhood Accident Rates within Regional Health Authority boundaries*

Region	*Death rates per million aged 1-14 years (average for 1978 and 1979)*	*Hospital discharges and deaths for fractures, dislocations, sprains, other injuries and reactions, rates per 1000 population (1977)*	
		0-4	*5-14*
Northern	116.8	21.1	11.9
Yorkshire	108.8	18.7	12.7
Trent	109.0	16.6	11.2
East Anglia	88.5	11.7	9.5
North West Thames	88.4	14.0	10.1
North East Thames	106.0	14.7	10.4
South East Thames	108.9	18.8	12.2
South West Thames	83.8	15.6	10.8
Wessex	76.0	14.4	10.9
Oxford	94.0	15.2	10.8
South Western	80.7	12.8	9.5
West Midlands	101.9	14.9	8.9
Mersey	102.7	18.5	12.6
North Western	122.9	18.5	11.1
Wales	113.9	21.3	12.9
England and Wales	102.6	16.6	11.0

Source: OPCS and HIPE

General's five social classes. There is a substantial social class differential in mortality from accidents and violence—the SMR for children of unskilled parents being nearly five times that for children of parents in the professions. [7] For pedestrian fatalities (which accounted

7. Class discrepancies have also been observed for specific types of non-fatal accident— see for example Learmonth's (1979) study of burns and scalds.

for over 70 per cent of the motor vehicle accidents) the former is more than seven times the latter. In fact social class variations in accident mortality explain a significant part of the discrepancy between the classes in all cause fatality rates. (Focusing on the latter the SMR for social class V is only 2.2 times that for social class 1.)[8]

These social class disparities have been linked to a number of factors. Preston (1979) has argued, for example, that the observed pattern of pedestrian fatalities reflects an absence of safe play areas available to the less well off. In support, Townsend's (1979) survey of poverty in the United Kingdom indicated that 44 per cent of children aged 1-14 years of semi-skilled parents had no safe place to play— nearly double the proportion found among the professional and managerial groups.

The report of a working group chaired by Sir Douglas Black entitled 'Inequalities in Health' (DHSS 1980) drew attention to the hazards associated with the growth of motor vehicle ownership and in particular to the dangers from industrial traffic faced by those living in inner city areas. The report also stated that 'apart from the specific danger of road traffic it is likely that the working class child lives in a more dangerous physical environment than middle class children. Derelict slum housing about to be cleared, deserted canals, mineshafts and factories, railway lines, rubbish tips; all these present dangers to the child in the urban industrial area'.

Investigating risk factors within the family unit Brown and Davidson (1978) concluded that psychiatric disorder in the mother and other long-standing difficulties such as poor health, shortage of money and marital tension appear to account for much of the class difference in the risk of accidents to children (Figure 7). Seeking explanations for the link between maternal psychiatric disturbance and accident risk the authors postulated that the increased irritability and loss of interest in their children reported by mothers when depressed may give rise to manifestations of distress in children leading to new behavioural patterns carrying a greater risk of accident.

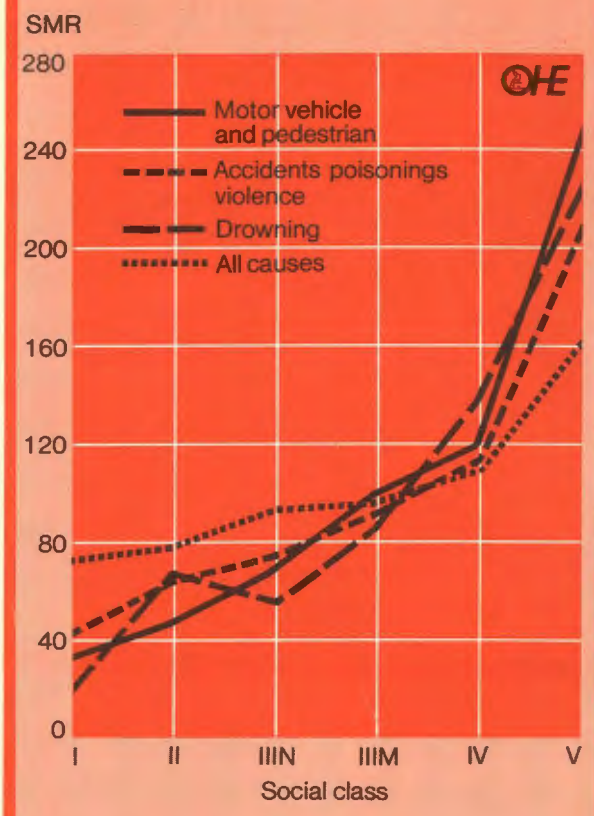
Sibert (1975) has shown that stress is an important factor in accidental ingestion of poisons in childhood although unlike Brown and Davidson (1978) he did not find any bias between the various social groupings. Comparing 100 families of children under 5 years admitted to Cardiff hospitals after accidentally ingesting poisons with a similar number of matched controls it was found that 30 of the affected families had more than one of five major stress factors (serious family illness, pregnancy, recent move, one parent away from home, anxiety or depression in one or both parents) compared with only four of the controls. Family stress might make poisons readily available to children, either because parents under stress may be less careful or because medicines are being used during illness. But Sibert considered altered child behaviour in an unhappy atmosphere with disordered family relationships to be a more likely explanation.

These and other research findings indicate that a better understanding of the aetiology of childhood accidents will require approaches beyond the 'traditional' interpretation of the problem as one of normal physical development in a hazardous and often unsupervised environment. In addition consideration must clearly be given to the relationships and interactions between families and their children (Calnan and Wadsworth 1977). In the context of reducing the incidence of accidental injury, however, it would appear that 'environmental modification' currently offers the most promising prospect for success.

Preston (1981), for example, has drawn attention to the creation of more 'safe play areas' as a means of reducing the number of children killed or injured on the roads. Poyner (1980) has suggested that there is scope for

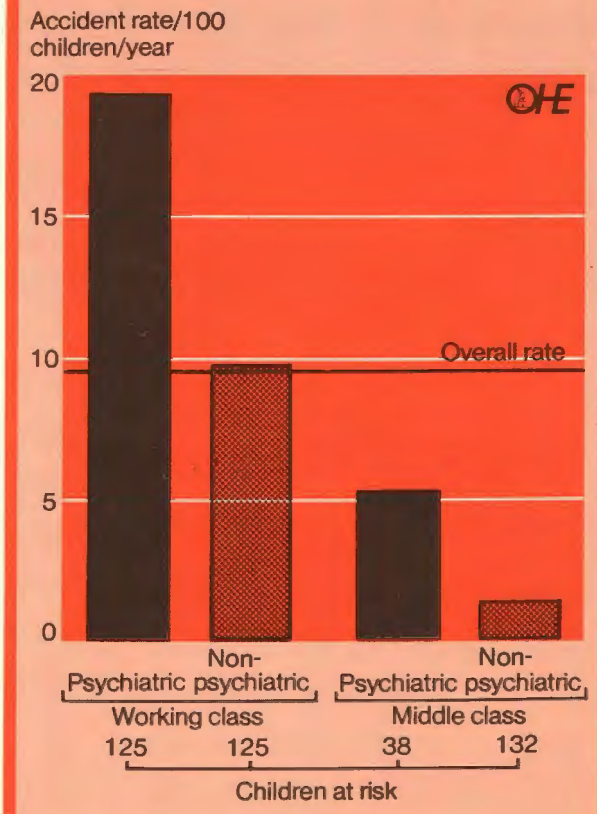
8. The first analysis by OPCS of deaths by social class for children aged 1-14 years (Adelstein and White 1976) covered the years 1959-63 and showed that the rising gradient in accident mortality rates between social classes 1 and V became less steep with age: thus among children aged 1-4 years the rate for social class V was 4.72 times that for social class 1; for those aged 5-9 and 10-14 the corresponding multiples were 4.60 and 2.1 respectively.

Figure 6 *Childhood mortality due to all causes and selected accidents by social class, males, England and Wales, 1970-72, Standard Mortality Ratios, all male children = 100*



Source: Office of Population Censuses and Surveys

Figure 7 *Number of serious accidents per 100 children at risk per year by psychiatric state and social class of mother*



Note: Based on findings in 420 children under 16
Source: Brown and Davidson 1978

environmental measures in the prevention of drowning by closing access through derelict land and filling disused industrial reservoirs and canals. The Black Report commented that 'it is probably in the home that major progress could be made most quickly. Regulations could be introduced immediately to produce a safer home environment for children and these could be applied stringently to public housing'. Greater sensitivity to the needs of children shown in design would help to avoid dangerous features such as balconies with horizontal bars which are readily climbed; easy access to garage roofs; glass doors placed at the bottom of staircases; cupboards located over cooking stoves; and badly positioned windows.

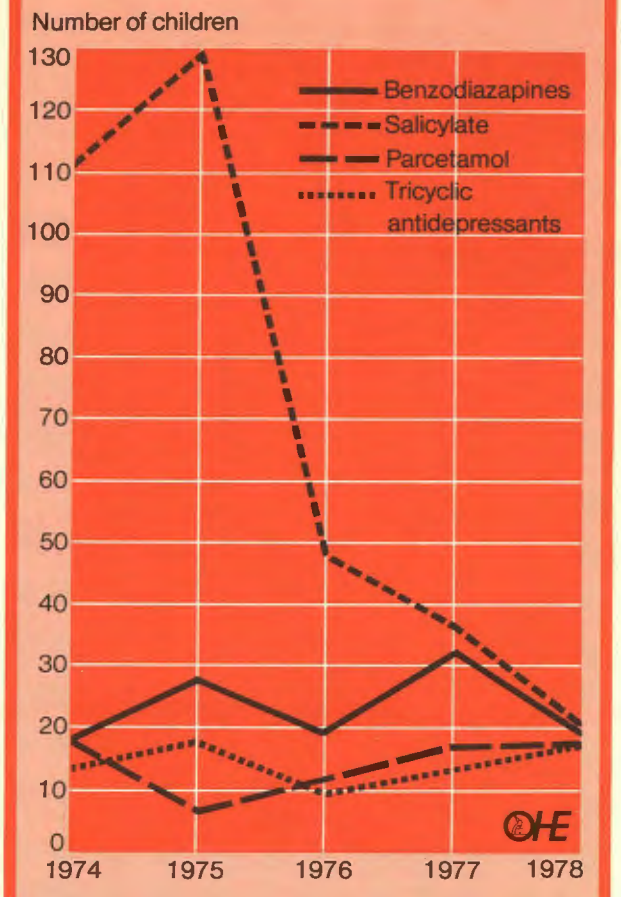
It would be misleading to infer from these comments that little progress in prevention has so far been achieved. Technological advance, for example, has clearly paved the way for fewer home accidents through, *inter alia*, the development of central heating and safer domestic electrical systems. However, with only a few exceptions, such as the decline in the number of fire deaths after the introduction of regulations governing the flame resistance of children's nightwear (Warne 1979) and local improvements in injury rates following implementation of road safety measurers (Snook 1981), it is frequently difficult to establish definitive causal associations between environmental changes and altered accident incidence rates, especially at a national level of analysis. Similarly, it is not possible to estimate the volume of fatal and non-fatal accidents avoided as a result of the efforts of lobby groups such as the Child Accident Prevention Committee, the various consumers organisations, the British Standards Institution, the Department of Prices and Consumer Protection and many other agencies in raising the safety standards of the domestic environment and elsewhere as well as those pertaining to most products and appliances in common use.

Even the link between the use of child resistant containers (CRCs) and the decline in accidental ingestion of medicines by children—widely regarded as an apparently good example of an environmental measure inducing an improved accident performance—remains a contentious issue. In the late 1960s concern was expressed at the growth in the volume of accidental poisoning in children (Jackson et al 1968). Examination of the aetiological factors underpinning these events suggested that effective preventive strategies did not lie in measures affecting the supply of medicines (Baltimore and Meyer 1968) nor in health education (Sibert 1975). Instead, following trials (Scherz 1970) and practical experience in the United States, attention focused on the use of CRCs. However, regulations requiring the use of such containers and child resistant packaging were not introduced in the United Kingdom until 1976 and even then they were restricted to solid dose preparations of aspirin and paracetamol.

There is nevertheless evidence that this relatively limited application has proved beneficial. Trends monitored in Newcastle and Cardiff (Figure 8) have shown a dramatic drop in the numbers of children under 5 years admitted to hospital following ingestion of salicylates (Sibert et al 1977; Sibert and Craft 1981). In a larger study, the same authors found that virtually all of the decline of 13.4 per cent in poisoning admissions to hospitals in Wales and Northern Region of England between 1974 and 1977 could be attributed to fewer analgesic poisonings (Sibert et al 1979). Nationally, hospital admissions for analgesic ingestion by children under 5 years have fallen from 3,884 in 1974 to 990 in 1978 (Jackson et al 1981). This drop was equivalent to approximately one third of the fall in poisoning from all causes over this period and Jackson and his colleagues suggest that the residual improvement may be a 'spin-off' from the use of and debate surrounding CRCs which has generated a greater awareness of the problem of accidental poisoning.

A consensus that these trends can be directly attributed to the introduction of CRCs does not, however, exist. The fall in hospital admissions has, for example, been related to the reduction in the pack size of aspirin for childhood use which accompanied the introduction of CRCs (Fell

Figure 8 *Number of children under five years admitted to hospital in Newcastle upon Tyne and South Glamorgan with accidental poisoning*



Source: Sibert and Craft 1981

1981) and to substantial changes in the appearance of the most popularly employed paediatric analgesic rendering it considerably less attractive to inquisitive children (Gartside 1981). Furthermore, it is clear from a number of investigations that 'child resistant' cannot be regarded as synonymous with 'child proof' (Department of Trade 1980). Clarification of these issues can only be achieved with data which discriminate between admission for observation and those for treatment, which specify the type of medicine involved and indicate whether it had been contained in child resistant packaging and finally which show trends in consumption, product substitution and population at risk. Unfortunately, little of this information is readily, if at all, available.

Aside from this specific debate much of the evidence quoted in this Briefing supports the widely held belief that environmental and product design provides the most effective key to accident prevention. This contention is in large part a reflection of the apparently extremely limited success of health education activities in promoting safety conscious behaviour among parents and their children. A review of a large selection of evaluated health education programmes (Gatherer et al 1979) identified four concerned with childhood accident prevention and only one of these showed any degree of success. [9] Further recent examples of 'failure' abound. Thus Preston (1980) has been unable to find any justification for the claim that the introduction of the Green Cross Code was responsible for a decrease in child pedestrian accidents. Woolfson (1981) in a review of the literature on the prevention of poisoning in childhood has commented that there is

9. This was the investigation by Spiegel and Lindaman (1977) which found a reduction in the incidence of falls from windows in New York following a media campaign, community education and distribution of free window guards. In view of the last this programme might perhaps more accurately be seen as an environmental approach.

'doubt about the cost effectiveness of education programmes aimed at changing human behaviour'. A follow up of three types of education programme showing mothers the value of child restraint systems in cars found there had been little effect in increasing the protection of infants (Reisinger and Williams 1978). A road safety campaign has recently been reported to have had no apparent effect on the road crossing behaviour of children during journeys to and from school (Downing and Spendlove 1981).[10]

Against this background it is not surprising that with the target of reducing the annual toll of childhood accidents an editorial in the Lancet (1979) commented: 'it is likely that safety devices built in as a constant feature of the environment are more effective than attempts to alter people's behaviour'. Nevertheless, health education does have an important role to play as one means of promoting better environmental and product design and in raising the general level of awareness of the problems discussed in this Briefing. In this context an important contribution derives from the individual and combined efforts of the Royal Society for the Prevention of Accidents, the Health Education Council, schools, the media, [11] local authorities and many other bodies. Although the benefits stemming from publicity campaigns and educational programmes generally cannot be identified in any tangible sense these activities should be seen as indispensable adjuvants to more specific environmental measures designed to reduce the numbers of children killed or injured accidentally each year.

10. The poor response to individual health education is probably explained by a combination of factors. For example, individuals who might be considered the most appropriate target for advice are probably those least able to make an effective response. It may also be linked to a tendency on the part of some parents to overestimate the capabilities of their children, giving rise to an inaccurate perception of potential risks. It should not however, be taken to imply irresponsible parental, or more specifically maternal, behaviour. As Graham (1979) has commented in a broader context 'patterns of behaviour which place a child's health at risk appear to result not so much from lack of responsibility but rather from a conflict of responsibility coupled with an uncertainty about how best to meet the competing demands that the family makes upon the mother'.

11. October 1981 sees the launch of a major nationwide campaign to reduce the incidence of accidents in childhood. It is centred on a new BBC series entitled 'Play it Safe' which will be complemented by a freely available publication from the Health Education Council.

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