TRANSPORT RESEARCH LABORATORY

TRL REPORT 225

VALUATION OF HOME ACCIDENTS: A COMPARATIVE REVIEW OF HOME AND ROAD ACCIDENTS

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Prepared for: Shropshire Child Accident Prevention Group
Project: Cost of Accidents in the Home (01846)

Transport Research Foundation Group of Companies
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First Published 1996
ISSN 0968-4107

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EXECUTIVE SUMMARY

Home accidents involving children have been identified as a major cause of injury and the Shropshire Child Accident Prevention Group is funding a variety of schemes to reduce such accidents. Valuations of accidents are required so that the benefit of reducing accidents can be expressed in monetary terms and compared with the costs of accident reducing initiatives. The Department of Transport values road accidents based on estimates of the associated costs and these values are uprated annually to take account of changes in Gross Domestic Product and accident patterns. This report presents work commissioned by the Shropshire Child Accident Prevention Group to review the methodology used in the valuation of road accidents, assess its applicability to home accidents and present preliminary estimates of home accident costs.

In road accident valuation, estimates of the costs are developed for accidents at four levels of severity: fatal, serious, slight and damage only. The costs are divided into two groups: those associated with casualties and those attributable to the accident. Accident related costs include the cost of property damage, the cost of police time in dealing with and recording accidents and the administrative costs of handling accident insurance claims. The accident related costs are likely to be substantially different for home accidents and further investigation is needed before it is possible to estimate these elements for home accidents. Accident related costs were therefore not considered further in this report and estimates of home accident costs were based solely on the casualty related costs.

Casualty related costs are estimated under three headings: the value of saving casualties, the costs of providing medical and support services and the value of lost contribution to the economy. Separate cost estimates are produced for fatal, serious and slight casualties. As injury severity varies within the serious and slight groups, casualties are divided into a number of 'injury state' groups according to the severity of their injuries, outcome and level of residual disability, and separate cost estimates are produced for each group. The individual costs are then weighted together to produce weighted average values for casualties in the serious and slight groups. To produce cost estimates for home accident casualties, the same methodology was adopted.

In the absence of a specific value for the cost of a home accident fatality, it was assumed that the value used for road accidents was also applicable to home accidents. This is estimated at £784,090, in 1994 prices, of which £510,880 is the value of avoiding injury, £272,690 is accounted for by lost output and £510 is medical and support costs.

To derive values for serious and slight casualties, the distribution of home accident casualties between the 'injury state' groups was developed using information on injuries, outcome and length of stay in hospital from the Department of Trade and Industry's hospital based survey of home accident casualties. Comparison of home and road accident casualties showed that home accident casualties tended to be concentrated into the less severe injury state groups and that the types of injuries, lengths of stay in hospital, outcome and age distributions are likely to be different. However, for the purpose of deriving initial estimates it was assumed that the costs in each group would be similar for casualties regardless of whether they had suffered a home or road accident.

To estimate the value of avoiding injury, the values derived for road accident injuries in each 'injury state' group were reweighted by the new distribution of home accident casualties between the groups. The value of avoidance of a home accident casualty was estimated to be £23,920 per serious and £2,660 per slight casualty. A value was also assigned to casualties treated by GPs, based on the amount derived from road accident research which would just make up for an injury involving minor cuts and bruises, £120.

The method of calculating lost output for road accident casualties is also applicable to home accidents. However, to reflect the less severe nature of home accident injuries, it was assumed that half as many slight home accident casualties took over a year to recover as for road accident casualties. Using the values of lost output calculated for casualties in each 'injury state' group the value of lost output was estimated at £2,880 per serious and £800 per slight home accident casualty. For casualties treated by GPs it was assumed that no time was taken off work and therefore no value for lost output was assigned to this group.

Medical and support costs were estimated at £2,020 per serious casualty and £470 per slight casualty. These estimates were based on the use of medical, Social Security and support services by road accident patients in the 'injury state' groups, with the exception of the use of the emergency ambulance service for which it was possible to take account of the different use by home accident casualties. Comparison of home and road accident casualties showed that a lower percentage of home accident casualties were brought to hospital by ambulance. In the calculations, the average number of emergency ambulance trips per casualty was adjusted to reflect this. Again, casualties treated by GPs were assumed not to incur any costs associated with medical or support services.

The total costs per casualty were estimated by adding the values for each element of cost. These were estimated at £28,830 per serious casualty, £3,920 per slight casualty (treated in hospital) and £120 per slight casualty (treated by GP). The estimate for a serious home accident casualty is a third of the value of a serious road accident casualty and the estimate for a slight casualty is just over half the road accident casualty value. Using these results and taking into account the proportions of seriously and slightly injured casualties, the average cost per non-fatal hospital treated casualty was estimated at £11,140 and the cost per non-fatal casualty (including those treated by GPs) was estimated at £8,300. The cost over all casualties, including fatalities, was estimated to be £9,460 per casualty.

To give some indication of the difference in cost for children, values were estimated for serious casualties in the 0-4, 5-14 and 15+ age groups. These were £24,440, £22,750 and £31,530 per casualty respectively. The weighted averages across all non-fatal hospital treated casualties were £6,160 per 0-4 year old casualty, £6,280 per 5-14 year old casualty and £12,410 per casualty aged 15 years or over.

To improve on these basic estimates a number of areas need to be addressed. These include the development of a revised set of 'injury state' descriptions based on the injuries, outcomes and levels of disability associated with home accidents, investigation into whether the values of saving casualties derived for road accidents are applicable to home accident casualties, the collection of more comprehensive information on the use of medical services and identification of the accident related costs associated with home accidents. Production of proposals detailing how this could be done would form a further stage to the work.

VALUATION OF HOME ACCIDENTS: A COMPARATIVE REVIEW OF HOME AND ROAD ACCIDENTS

ABSTRACT

Valuations of accidents are required so that the costs of accident reducing initiatives can be compared with their benefits in monetary terms. The methodology and data used for estimating the cost of road accidents and casualties has recently been revised and all components of road accident costs have been updated. This report summarises the methods used for costing road accidents and assesses the applicability of using such methods in the estimation of home accident costs. The report presents basic estimates of home accident casualty costs based on the values derived for road accidents and currently available home accident information.

1. INTRODUCTION

Home accidents to children have been identified as a major cause of injury and the Shropshire Child Accident Prevention Group is funding a variety of schemes to reduce such accidents. Nationally, some 3 million home accidents are estimated to occur per year (Department of Trade and Industry, 1993). In comparison only around 300,000 road accident casualties are recorded annually. In order to justify resources aimed at reducing accidents, estimates of the costs of accidents to the community are required, so that the benefits of reducing accidents in monetary terms may be compared with the costs of funding safety schemes.

Monetary estimates of the costs of road accidents are calculated from estimates of the costs associated with casualties and accidents. These costs are uprated annually to take account of changes in Gross Domestic Product (GDP) and accident patterns. It was considered that if the factors taken into account within road accident cost estimates were reflected in the methodology used for home accidents, the resulting cost estimates would better reflect the benefits of reducing home accidents in monetary terms.

Since 1988, the Department of Transport (DOT) has valued road accident fatalities using a Willingness to Pay approach, whereby individuals place a value on a small decrease in the risk of a fatal accident. This approach is consistent with cost benefit analysis in that decisions reflect the preferences and attitude to risk of people who are likely to be affected by them. A Willingness to Pay approach was used to revise the values for non-fatal road accident casualties in 1993 and 1994. Accident related costs were also updated. These revisions were based on the results of research conducted and managed at the Transport Research Laboratory (TRL) which collected new information on costs associated with casualties and accidents.

The Shropshire Child Accident Prevention Group therefore asked TRL to put forward a proposal concerning the applicability of road accident costing to home accidents and how the values might be improved. This report covers the first stage of the work to review the methodology used for road accidents, assess the extent to which it could be used to estimate home accident costs and derive basic cost estimates using currently available data. The second stage would be to put forward detailed proposals for further work to improve the cost estimates.

The report begins by comparing the characteristics of home and road accident casualties, Section 3 presents a brief summary of the methodology used for the valuation of road accidents and the implications for costing home accidents are discussed in Section 4. Section 5 presents estimates of the cost of home accidents and Section 6 discusses these results and briefly describes how they could be improved upon.

2. COMPARISON OF HOME AND ROAD ACCIDENT CASUALTIES

National road accident data are collected by the police when they attend road accidents or have accident details reported to them. The information collected contains details of accident circumstances such as who and what was involved and what happened but the only clinical information is confined to an estimate of the severity of the worst injuries suffered by each casualty into three categories: fatal, 'serious' or 'slight' (see Appendix A). The information is recorded onto a standard form known as a Stats19 form and subsequently transferred to the Stats19 database. A copy of this database is held at TRL.

Home and road accident data are collected by the Department of Trade and Industry (DTI) at a sample of 17 hospitals throughout the U.K. via their Accident Surveillance System (HASS). Information is collected on casualties who attend the Accident and Emergency Departments for treatment following an accident. This data contains clinical details for each casualty such as the types of injuries, outcome or referral for further treatment and length of stay in hospital in addition to details of the accident circumstances. As the hospitals differ in their procedures for fatalities, not all of these are recorded and therefore only information on non-fatal casualties is considered here. Information collected on road accidents and

casualties is also held on a database at TRL, data collected on home accidents is held by the DTI.

Tabulations of data on home accident casualties were obtained from the DTI's HASS database for casualties who attended hospital during 1992. Basic information on home accident fatalities was obtained from published tables of information from the Home Accidents Deaths Database (HADD).

In the following sections, the characteristics of home accident casualties were compared with those of road accident casualties using the data collected via the DTI's HASS system or by the police. Any differences between the characteristics of home and road accident casualties will have implications for estimating costs for home accidents. Throughout the analysis three groups of home accident casualties were considered; those aged 0-4, 5-14 and 15+ years.

2.1 INJURY SEVERITY

Using information on the types of injuries and whether the patient was admitted to hospital, casualties in the HASS survey were classified as 'serious' or 'slight' according to the definitions in Appendix A. The proportions of home and road accident casualties who were seriously and slightly injured is shown in Table 1. Overall, the proportions of seriously and slightly injured casualties were similar with around a quarter of casualties being classed as 'serious' and three quarters as 'slight'. Home accident casualties aged under 15 were slightly less likely to be 'seriously' injured than road accident casualties of the same age, whereas home accident casualties aged 15 or over were slightly more likely to be seriously injured.

A wide range of injuries are included in the DOT severity categories for casualties, particularly the 'serious' category and these have differing cost implications; some injuries have limited and short term consequences and therefore involve little cost to the nation, whereas others result in prolonged and intensive hospital treatment and severe and permanent disability.

To estimate the cost of road accident injuries within the 'serious' category more accurately, it was necessary to split the 'serious' group into a number of more homogenous sub groups. A group of experts derived a set of 'Injury State Descriptors', which together comprise the range of 'serious' injuries, summarising in plain English the consequences of injuries. The descriptors cover several dimensions: extent and duration of pain or discomfort, period of treatment in hospital, recovery period, consequences for home and working life and level of residual disability. The descriptors are listed in Table 2, which also shows a shorthand letter code which is used for reference to individual injury states; these codes are used in the remainder of this report.

For road accident costing, the percentage distribution between groups was estimated for casualties with a 'serious' injury reported by the police in national accident statistics. This percentage distribution was estimated on the basis of the results of the statistical studies of police and hospital data, work on linking police and hospital data for road accident casualties and expert clinical judgement.

To compare the severity distribution for 'serious' home and road accident casualties, home accident casualties in the three age groups were classified into the injury state groups using the information available from HASS on injury type, outcome and where appropriate, length of stay in hospital.

It was not possible to classify home accident casualties accurately to these groups for a number of reasons. Firstly, the length of stay for casualties who were transferred to specialist or other hospitals was not known, and no information was available on the recovery period or level of residual disability for any casualty. To assign casualties to the groups it was assumed that those referred to specialist hospitals stayed for several weeks and that the distribution of length of stay for casualties referred to other hospitals matched that of casualties admitted to the hospitals in the HASS survey. Estimates of the likely recovery period and resulting disability took account of the type of injury and referral details. Secondly, casualties may have had more than one injury but it was not possible to identify the

TABLE 1

Severity distribution: non-fatal casualties

DOT severity rating	Home accident casualties				Road accident casualties			
	0-4 %	5-14 %	15+ %	All %	0-4 %	5-14 %	15+ %	All %
Serious	25	28	31	29	30	30	24	25
Slight	75	72	69	71	70	70	76	75

TABLE 2

Injury state groups

Injury code	Description	Summary description
F	No overnight stay in hospital (seen as an out-patient); experience slight to moderate pain for 2-7 days followed by some pain/discomfort for several weeks; some restrictions to work/leisure activities for several weeks/months; after 3-4 months, return to normal health with no permanent disability.	Recover 3-4 months (Out-patient)
W	In hospital 2-7 days in slight to moderate pain; after hospital, some pain/discomfort for several weeks; some restrictions to work and/or leisure activities for several weeks/months; after 3-4 months, return to normal health with no permanent disability.	Recover 3-4 months (In-patient)
X	In hospital 1-4 weeks in slight to moderate pain; after hospital, some pain/discomfort, gradually reducing; some restrictions to work and leisure activities, steadily improving, after 1-3 years, return to normal health with no permanent disability.	Recover 1-3 years
V	No overnight stay in hospital (seen as out-patient); moderate to severe pain for 1-4 weeks; thereafter, some pain gradually reducing but may recur when you take part in some activities; some permanent restrictions to leisure and possibly some work activities.	Mild permanent disability (Out-patient)
S	In hospital 1-4 weeks in moderate to severe pain; after hospital, some pain gradually reducing, but may recur when taking part in some activities; some permanent restrictions to leisure and possibly some work activities.	Mild permanent disability (In-patient)
R	In hospital several weeks, possibly several months in moderate to severe pain; after hospital, continuing permanent pain, possibly requiring frequent medication; substantial and permanent restrictions to work and leisure activities; possibly some prominent scarring.	Some permanent disability with scarring
N	In hospital several weeks, possibly several months; loss of use of legs and possibly other limbs due to paralysis and/or amputation; after hospital, permanently confined to a wheelchair and dependent on others for many physical needs, including dressing and toiletting.	Paraplegia/ quadriplegia
L	In hospital several weeks, possibly several months due to head injuries resulting in severe permanent brain damage; after hospital, mental and physical abilities greatly reduced permanently; dependent on others for many physical needs, including feeding and toiletting.	Severe head

combinations of injuries suffered by individual patients from the information provided by the DTI. Instead the percentage distribution for each age group was derived from numbers of injuries and this was assumed to be applicable to the numbers of casualties in each age group. This will slightly over estimate the proportion of casualties with slight injuries since those with serious injuries are likely to have some slight injuries as well.

Table 3 shows the distribution of home and road casualties between the injury groups.

Within the 'serious' group it appears that the spread of home accident casualties amongst the injury state categories is less than for road accident casualties, with most casualties falling in the F and W groups. This implies that home accident casualties are less severely injured. From the estimated distribution, it was estimated that 'serious' home accident casualties are more likely to be treated as

TABLE 3

Severity distribution: serious casualties

Injury state	Home accident casualties 0-4 %	5-14 %	15+ %	All ages %	Road accident casualties %
Recover 3-4 months (Out-patient): F	69	78	70	71	19
Recover 3-4 months (In-patient): W	24	13	12	15	13
Recover 1-3 years (In-patient): X	1	1	6	4	36
Mild permanent disability (Out-patient): V	3	6	6	5	5
Mild permanent disability (In-patient): S	<1	<1	1	1	12
Some permanent disability with scarring: R	3	2	4	4	13
Paraplegia/quadriplegia & severe head injuries: N/L	<1	0	<1	<1	2

out-patients and less likely to be admitted to hospital. Around three-quarters of 'serious' home accident casualties were treated as out-patients compared with a quarter of 'serious' road accident casualties.

'Serious' home accident casualties were also estimated to recover more quickly: 86 per cent within 3-4 months, 4 per cent within 1-3 years but 10 per cent would be left with some residual disability. In comparison 34 per cent of 'serious' road accident casualties recovered in 3-4 months, 31.5 per cent in 1-3 years and 34.5 per cent were left with some disability.

2.2 CASUALTY AGE

Table 4 shows the distribution of age for casualties with fatal, 'serious' or 'slight' injuries. The table shows that amongst fatalities, the overall proportions of children and

TABLE 4

Percentage of casualties in each age group by injury severity

Severity/ Age group	Home accident casualties %	Road accident casualties DTI %	Stats19 %
Fatal			
0-4	3.3	-	1.6
5-14	1.5	-	6.4
15+	95.2	-	92.0
Non-fatal: serious			
0-4	21.4	2.7	2.1
5-14	15.1	14.8	12.7
15+	63.5	82.5	85.0
Non-fatal: slight			
0-4	25.8	2.1	2.3
5-14	16.0	11.1	11.5
15+	58.1	86.8	86.2
All non-fatal			
0-4	24.6	2.2	2.3
5-14	15.7	12.0	11.7
15+	59.7	85.8	86.0

Note: In Stats19 data, age groups are 0-4, 5-15 and 16+.

older people are similar: 5 per cent of home accident fatalities are aged under 15 compared with 8 per cent of road accident fatalities. However, amongst home accident fatalities young children (aged 0-4) comprise a larger proportion than older children whereas amongst road accident fatalities the opposite is the case. Amongst non-fatal casualties, a greater proportion of home accident casualties are aged under 15; around 40 per cent compared with only 14 per cent of road accident casualties. Around a quarter of non-fatal home accident casualties are aged under 4 compared with only 2 per cent of road accident casualties.

2.3 NUMBER AND TYPE OF INJURIES

On average, home accident casualties suffer slightly fewer injuries per patient than road accident casualties, as Table 5 shows. The difference is less amongst children aged 0-4, than children aged 5-14 and older people. The number of injuries per casualty increases slightly with age.

TABLE 5

Average number of injuries per casualty

Age group	Home accident casualties	Road accident casualties
0-4	1.15	1.32
5-14	1.17	1.75
15+	1.20	1.64
All ages	1.19	1.64

The types of injuries suffered by road and home accident casualties in each age group is shown in Table 6. The majority of injuries in both home and road accidents are cuts, bruises and other soft tissue injuries which account for around two-thirds to three-quarters of injuries in each age group. In general, home accident casualties are more likely to suffer cuts, burns, poisonings, and internal injury/suffocation than road accident casualties, and less likely to suffer grazes/splinters and concussion. Among home accident casualties, the incidence of burns and poisoning/chemical injury is relatively high amongst casualties aged 0-4. Home accident casualties aged 15 years or more are also more likely to suffer fractures and less likely to suffer dislocations than road accident casualties but this is not so apparent in the younger age groups.

2.4 USE OF THE AMBULANCE SERVICE

Road accident costs include the cost of medical and support services used by victims. Home accident data collected by the DTI does not contain detailed information on the use of medical services by home accident casualties. However, use of the ambulance service which is one element of the medical costs, is included.

The proportion of home and road accident patients who are brought to hospital by ambulance is shown in Table 7. Home accident casualties are generally much less likely than road accident casualties to be brought to hospital by ambulance. This is the case for both 'serious' and 'slight' casualties. Children injured in home accidents are less likely to be brought to hospital by ambulance than older casualties. This is not the case for road accident casualties where the propensity to be brought by ambulance does not vary consistently with age. However, children who are seriously injured are slightly less likely than older casualties to be brought by ambulance and those who are slightly injured are slightly more likely.

2.5 LENGTH OF STAY IN HOSPITAL

Another measure of severity for in-patients is their length of stay in hospital. This is also a good indicator of in-hospital medical costs (Galasko, 1986) and forms another element of the medical services costs in road accident costing. As mentioned earlier, length of stay in hospital was not known for all in-patients. It was therefore assumed that patients who were transferred to other general hospitals had similar lengths of stay to those who were admitted to the hospitals in the DTI sample. The length of stay for patients who were transferred to specialist hospitals was also unknown. It could be considered that these patients would have longer lengths of stay than those admitted to general hospitals but as no further information was available, the distribution was estimated using two 'extreme' assumptions. Firstly that the length of stay of casualties admitted to specialist hospitals did not differ from those admitted to the study hospitals at all, and secondly assuming that casualties transferred to specialist hospitals were all in the highest length of stay category, 31+ nights. Table 8 shows the resulting ranges for the percentage of casualties in each length of stay group. A length of stay of 0 nights is possible if patients were admitted and discharged the same day.

In general, home accident casualties are less likely to stay in hospital overnight. This could be because road accident casualties are more likely to be kept in hospital for observation, following injuries such as concussion. Children aged up to 15 are more likely to stay up to a week but less likely to stay up to a month, whereas those aged 15 or over are less likely to stay for a week but more likely to stay up to a month. Over all ages, home accident casualties are slightly more likely to stay for long periods (31+ nights) but this was mostly accounted for by casualties aged 15+ rather than children. However, if children transferred to specialist hospitals were considered to stay 31+ days, their proportion in the 31+ nights length of stay group is higher than for road accident casualties.

TABLE 6

Distribution of injury types by age group

Age (years)	Injury type	Home accident casualties %	Road accident casualties %
0-4	Graze/splinter	4.0	20.3
	Bruise/contusion	16.6	22.2
	Cut/other open wound	32.9	15.0
	Other soft tissue injury	16.7	18.6
	Burn/scald	6.6	0.1
	Dislocation/sprain	2.6	2.2
	Fracture	5.2	5.3
	Concussion	3.0	5.5
	Poisoning/chemical injury	7.8	-
	Internal injury/suffocation	0.6	0.1
	Other injury	2.6	4.8
	Unknown injury	1.4	5.9
5-14	Graze/splinter	4.1	22.1
	Bruise/contusion	14.6	19.1
	Cut/other open wound	31.9	11.6
	Other soft tissue injury	24.3	24.7
	Burn/scald	3.1	-
	Dislocation/sprain	4.7	4.1
	Fracture	10.7	8.9
	Concussion	1.5	3.5
	Poisoning/chemical injury	1.0	-
	Internal injury/suffocation	0.8	0.1
	Other injury	2.0	3.0
	Unknown injury	1.3	2.9
15+	Graze/splinter	3.8	11.4
	Bruise/contusion	12.9	14.6
	Cut/other open wound	28.4	9.9
	Other soft tissue injury	25.7	31.2
	Burn/scald	3.6	<0.1
	Dislocation/sprain	6.5	13.3
	Fracture	12.6	7.9
	Concussion	0.6	2.1
	Poisoning/chemical injury	0.8	<0.1
	Internal injury/suffocation	1.2	0.3
	Other injury	2.1	5.2
	Unknown injury	1.8	3.9
All ages	Graze/splinter	3.9	12.6
	Bruise/contusion	14.0	14.8
	Cut/other open wound	30.0	9.9
	Other soft tissue injury	23.4	29.2
	Burn/scald	4.2	<0.1
	Dislocation/sprain	5.3	11.5
	Fracture	10.7	7.7
	Concussion	1.3	2.3
	Poisoning/chemical injury	2.4	<0.1
	Internal injury/suffocation	1.0	0.3
	Other injury	2.2	4.8
	Unknown injury	1.7	3.7

TABLE 7

Percentage of casualties brought in by ambulance by injury severity and age

DOT severity/ age group	Home accident casualties	Road accident casualties
Serious		
0-4	7	55
5-14	6	62
15+	21	70
All ages	16	68
Slight		
0-4	3	40
5-14	2	38
15+	7	36
All ages	5	37
All non-fatal		
0-4	4	45
5-14	3	45
15+	11	44
All ages	8	44

2.6 SUMMARY OF CASUALTY CHARACTERISTICS

In conclusion, the comparison of home and road accident casualties has shown that similar proportions of home and road accident casualties are slightly or seriously injured overall, but that home accident casualties under 15 are slightly less likely to be seriously injured compared with road accident casualties of the same age and home accident casualties over 15 are slightly more likely to be seriously injured.

Within the 'serious' group, home casualties tend to be concentrated within two less severe injury state groups whereas road accident casualties are spread more evenly between groups. 'Serious' home accident casualties are estimated to be more likely to be treated as out-patients and to recover more quickly than road accident casualties, with a lower proportion being left with permanent disability. Home accident casualties are less likely than road accident casualties to be transported to hospital by ambulance. They are also less likely to stay in hospital overnight but children were more likely to stay up to a week and older people more likely to stay for longer periods.

The age distribution does not vary markedly between home and road accident fatalities, but children make up a much larger proportion of non-fatal home accident casualties than in road accident casualties.

Home accident casualties suffer slightly fewer injuries per patient than road accident casualties. Although most injuries in both groups are cuts, bruises and soft tissue injuries, the types of injuries vary between the groups with home accident casualties being more likely to suffer cuts, burns, internal injury and suffocation, and fractures (in the case of older casualties).

TABLE 8

Distribution of length of stay in hospital: in-patients

Accident type/ age group		Length of stay (nights) 0-1	2-7	8-30	31+
Home accident casualties					
0-4	%	36 - 41	49 - 55	3	1 - 13
5-14	%	27 - 31	55 - 63	4	1 - 14
15+	%	10 - 11	34 - 39	31 - 36	15 - 25
All ages	%	18 - 21	40 - 45	22 - 24	10 - 21
Road accident casualties					
0-4	%	51 - 54	32 - 33	12 - 13	0 - 5
5-14	%	40 - 42	37 - 39	13 - 14	5 - 10
15+	%	28 - 29	40 - 41	24 - 25	5 - 8
All ages	%	30 - 32	39 - 41	22 - 23	5 - 9

3. REVIEW OF METHODOLOGY FOR VALUATION OF ROAD ACCIDENTS

Road accidents are valued by dividing costs into two groups: casualty-related costs and accident-related costs. The accident related costs occur regardless of whether the accident results in any casualties. Accidents are divided into four groups according to the severity of the most severely injured casualty, (fatal, 'serious', 'slight' and damage only accidents) and separate estimates of casualty and accident related costs are developed for each group.

Casualty-related costs are estimated as an average per casualty at each level of severity; the average per accident is then estimated, using the average number of casualties of each severity in each type of accident. Accident related costs are estimated per accident at each level of severity. Current estimates of the casualty related costs and the accident related costs for road accidents, at 1994 prices, are shown in Tables 9 and 10.

For injury accidents, the total value of an accident is the sum of the average casualty related cost per accident and the average accident related cost, at that level of severity. The casualty related cost takes into account the average number of casualties of each level of severity likely to be involved in an accident of that level of severity. For damage only accidents, there are no casualty related costs.

The numbers of accidents and casualties used to estimate the average costs are based on the numbers recorded by the police in national accident statistics; thus accidents which are not reported to the police, which tend to be less severe on average, are not included.

3.1 CASUALTY RELATED COSTS

Casualty related costs are estimated under three headings: the value of saving casualties, the cost of providing medical, Social Security and other support services, and the lost contribution to the economy (lost output).

As mentioned earlier, a wide range of injuries are included in the DOT severity categories for casualties, particularly the 'serious' category. Some injuries classified as 'slight' can have long term effects: 'whiplash' neck injuries often result in a prolonged period of temporary disability for example, while the majority of slight injuries are minor cuts and bruises which have only limited short term consequences.

TABLE 9

Summary of costs per road accident casualty: June 1994 prices

Casualty severity	Lost output	Value of avoidance of injury	Medical & support	Total
Fatal	£272,690	£510,880	£510	£784,090
Serious	£11,500	£70,910	£6,790	£89,380
Slight	£1,220	£5,190	£520	£6,920
Average	£5,880	£20,750	£1,470	£28,100

TABLE 10

Summary of costs per road accident: June 1994 prices

Accident severity	Damage to property	Insurance administration	Police cost	Total
Fatal	£5,880	£160	£1,020	£7,070
Serious	£2,710	£100	£140	£2,950
Slight	£1,590	£60	£30	£1,690
All injury	£1,840	£70	£60	£1,980
Damage only	£1,020	£30	£2	£1,050
Average	£1,070	£30	£6	£1,110

To reflect this range of severity, estimates of casualty related costs are developed for sub-groups of casualties within the 'serious' and 'slight' groups. The two standard injury groups are subdivided, and cost estimates for the sub-groups are weighted together to derive average costs for 'serious' and 'slight' injuries.

3.1.1 Injury severity

The estimated percentage distribution of casualties between the injury state groups shown in Table 3 is used to weight together the cost estimates for each group to produce an overall estimate for 'serious' road accident casualties.

For casualties with 'slight' injuries, different methods of subdividing injuries are used for different components of casualty costs.

To assess the value of saving injuries, and for estimating lost output, casualties with 'slight' injuries are divided between those with 'whiplash' and those with other slight injuries. About 20 per cent of 'slight' casualties recorded by the police are estimated to have 'whiplash' injuries, and the rest have minor cuts and bruises. Clinical judgement suggested that half of the whiplash patients recover within one year and half take between one and three years to recover. Research on injury valuation showed that those recovering in the first year could be considered to be equivalent to those in injury state group W (recover 3-4 months), and the remainder in group X (recover 1-3 years). Thus altogether, 90 per cent of slight casualties were estimated to recover within a year of the accident, and 10 per cent were in the group with longer term recovery.

For estimating medical and support costs, the distribution of casualties with 'slight' injuries treated in hospital between injury state groups was estimated. Casualties with 'slight' injuries are by definition those requiring only outpatient treatment. Casualties are divided between the two groups treated as outpatients: 79.7 per cent in group F (recover 3-4 months) and 20.3 per cent in group V (mild permanent disability).

3.1.2 The value of saving casualties

The value of saving casualties is based on 'Willingness to Pay' for safety.

The theory underlying Willingness to Pay is that decisions in the public sector which improve safety reduce the risk of an individual being killed or injured, so that a safety improvement can be considered to be avoiding a 'statistical' injury. For small reductions in risk, the total value which society as a whole is willing to pay to avoid a statistical injury is equivalent to the marginal rate of substitution of wealth for the probability of being injured (or the small amount of money, at the margin, which people are prepared to pay to reduce the risk of injury). The average of individual values for the population affected by the safety improvement represents the marginal rate of substitution of wealth for that group as a whole.

Also, in a decision making framework where people will try to make themselves as well off as possible given their circumstances, the ratio of the marginal rate of substitution of wealth for the risk of all injuries to the marginal rate of substitution of wealth for the risk of death is equivalent to the ratio between the change in risk of injury and the change in risk of death.

3.1.2.1 Fatalities

The value of saving road accident fatalities is based on the results of a stated preference survey of the general public (Jones-Lee et al, 1985) and revealed preferences from research on wage rates in high risk occupations. Following consultation and an evaluation of research findings, the value of saving a fatality was set at £500,000 (including resource costs of medical services and lost output) in 1987 prices (Dalvi, 1988). A considerable degree of judgement was used in deciding on this value, but it has received wide acceptance as a Willingness to Pay estimate of the value of preventing one fatal road accident casualty.

Since 1988, this value has been increased by the growth in GDP; at June 1994 prices the value of saving a fatality was £784,090. This value encompasses all aspects of the cost of a fatality, both the resource costs of gross lost output (i.e. loss of potential production and consumption) and medical costs, and the less tangible human costs. Subtracting medical costs (£510), and the gross cost of lost output (£272,690), gives a figure of £510,880 for the human cost component of the value of avoidance of a fatal road accident casualty.

3.1.2.2 Non-fatal casualties

The methods used to derive the value of avoidance of non-fatal casualties are linked with the value of avoidance of a fatality, and used a similar approach, based on a national sample survey of willingness to pay to reduce the risk of injury. Values are derived for a range of injuries with different levels of severity within the 'serious' category, which could be weighted to produce an overall average value of avoidance of a 'serious' injury.

Indirect estimates of the value of 'serious' injuries are made relative to the value of a fatality, using the 'Standard Gamble' approach; individuals are asked to specify the level of risk at which they would opt for treatment for an injury, which if it succeeded would return them to normal health, and if it failed, would result in more severe consequences, or in some cases, death. The point where it was most difficult to decide whether to accept the risky treatment is the 'best estimate' for that person of the ratio between the marginal rate of substitution of wealth for risk of injury for the two injury states. Values are derived for the injury state descriptors (shown in Table 2) in relation to 'normal health' and 'death'.

Using the survey results, it was possible to convert the ratios for each injury state into values relative to the value for death. The human cost element of a non-fatal casualty is measured relative to the human costs and consumption component of a fatality. Consumption is included since the ability to consume goods and services is seen as part of the enjoyment of life and would therefore be taken into account by respondents in Willingness to Pay surveys. The value of consumption is estimated at £217,480. Adding this to the human cost figure shown in Table 9 gives a value of £728,360.

The weighted mean value of avoidance of a serious injury is just under 10 per cent of the value of avoidance of a fatality, so given a value of avoidance of a fatality of £728,360, the value of avoidance of a 'serious' injury is £70,910.

The value for some of the 'slight' injuries is derived in a similar way. People in the willingness to pay survey considered 'whiplash' neck injuries to be a little better than 'serious' injuries in group X (recover in 1-3 years), but much worse than those in group W (recover in 3-4 months). The values of injuries in groups X and W in relation to death could be used to determine a value for 'whiplash' neck injuries: £25,490. For the remaining 'slight' injuries, a value was derived from the survey for a sum of money which would 'just make up for' an injury involving minor cuts and bruises: £120 (1994 prices). The weighted mean overall value of avoidance of a 'slight' injury is £5,190.

3.1.3 Medical and support costs

Costs for fatalities are based on data provided by the Department of Health on the number admitted to hospital, length of stay, treatments received and costs of services and overheads, and total £510 per fatality.

Costs for non-fatal casualties are based on panel surveys of road accident patients treated in hospital in the Greater Manchester area. These surveys collected detailed information on all treatment received and services used in the first 18 months after the accident. Data on use of services are converted into costs using information on the unit costs of providing each service. Costs are calculated for each injury state descriptor group and weighted together to provide overall averages for casualties with 'serious' and 'slight' injuries.

The costs comprise the main costs of hospital treatment, (intensive care, neurosurgery ward, plastic surgery ward, general ward, accident and emergency department, orthopaedic clinic, fracture clinic, physiotherapy, plastic surgery clinic, neurosurgery clinic, other clinics) emergency ambulance, other ambulance, district nurse, medical appliances, and Social Security benefits. GP treatment is not included, and personal costs are also excluded.

For some of these costs, averages for England as a whole are available from the Department of Health. Where possible the Manchester unit costs were replaced with the up to date DOH estimates to provide the best available estimate of the likely costs. The weighted average cost totals £6,970 for 'serious' casualties and £520 for 'slight' casualties.

3.1.4 Lost output

The value of lost output for fatalities is derived by estimating loss of future production. The estimates take account of the age and sex distribution of casualties, average earnings, activity rates and mortality rates. The stream of future earnings is discounted back to its present value to derive gross lost output.

For non-fatal casualties, lost output is calculated by weighting together lost output after one year, lost output for those who recover from their injuries after more than a year, and in the case of those with 'serious' injuries, lost output for those who are permanently and severely disabled. The proportion of people in each group is estimated from a panel survey of road accident patients treated in hospital, with 57.2 per cent of those with 'serious' injuries recovering in a year, 40.6 per cent in 1-3 years and 2.2 per cent assumed to be permanently unable to work. For 'slight' injuries, 10 per cent are assumed to take 1- 3 years to recover, the rest recovering in the first year.

For those recovering in the first year, data on time off work for road accident patients is applied to income data for each age group to produce costs of lost output in the first year. For those recovering later, it is assumed that they recover after 2 years. Lost output in the first year is calculated as for those recovering in a year, and for the second year, income is discounted to derive the present value of lost output. Lost output for the permanently and severely disabled is calculated in the same way as for fatalities.

The value of lost output is £272,690 for fatalities, £11,500 for 'serious' casualties and £1,220 for 'slight' casualties.

3.1.5 Final note on casualty related costs

These are considered to be the main costs to the nation associated with each casualty, but are recognised to be minimum estimates; some types of cost are not included, often due to difficulty in identifying costs accurately, but at the level of average costs per 'serious' or 'slight' casualty, these are likely to be small amounts. Examples of costs excluded are: costs to the individual associated with time off work (other than lost earnings), travelling to hospital or staying in hospital, medication, costs associated with long term disability (such as adapting homes or cars) and costs of private medical treatment; costs to carers; some costs to the nation are also excluded: long term costs to the Department of Health and the Department of Social Security (for casualties who do not recover within 18 months of the accident), and costs of GP consultations.

3.2 ACCIDENT RELATED COSTS

Some costs arise as a result of road accidents, regardless of whether or not there are any injuries. Those which are taken account of in road accident costing are costs of police time, insurance administration, and damage to vehicles and other property.

These costs are estimated for accidents at each level of severity on the basis of studies of police time devoted to road accidents, and a survey of insurance claims. The average costs for all road accidents including damage only accidents, are £1,070 for property damage, £30 for insurance administration and £6 for police time.

4. IMPLICATIONS FOR COSTING HOME ACCIDENTS

This section assesses the extent to which the methods of costing road accidents are appropriate to costing home accidents. The basic approach of dividing costs into those associated with the casualty and those associated with the accident is as applicable to home accidents as it is to road accidents. However home accidents involving more than one casualty are relatively rare compared with road accidents.

4.1 INJURY SEVERITY

Home accidents do not appear to have such a wide spread of severity as road accidents, so dividing the casualties into several groups according to the severity of their injuries is less important. Dividing casualties into severity groups does help the costing process however, because costs can more readily be developed for more homogeneous sub groups, and weighted together afterwards.

If home accident casualties are divided into injury state groups in the same way as road accident casualties as was done in Section 2.1, then components of relevant costs for road accidents can be applied to each group to provide preliminary estimates of home accident costs. There may be some differences, for example length of stay in hospital for the same type of injury may be different because the age distribution of home accident casualties is different, with more children involved. In addition home accident casualties are more likely to receive some types of injury, such as burns and poisonings which are not adequately accounted for in the range of injury states. However as a basis for developing preliminary cost estimates, this is sufficient.

4.2 THE VALUE OF SAVING INJURIES

The Willingness to Pay approach has been used to value safety in a number of different contexts, it is not unique to road safety. The approach is suitable for estimating the value of saving death or injury in home accidents.

There is some evidence to suggest that the value of saving a fatality does not vary widely given different contexts (discussed in Soby and Ball, 1991) but some research is needed to assess whether the actual values used for road safety are applicable to the context of home accidents. It could be argued that because home accidents do not have such a high public profile as road accidents, and people are probably less worried about them on a day to day basis, then the values might be lower. On the other hand, the greater involvement of babies and young children in home accidents compared with road accidents might mean that home accidents are a more emotive issue.

4.3 MEDICAL AND SUPPORT COSTS

Identification of services used by patients with injuries of different levels of severity and then weighting them together and estimating their costs is applicable equally to home and road accidents. The number of home accident patients with injuries resulting in long term consequences was estimated earlier to be lower than for road accidents, so a shorter period of data collection may be applicable.

Analysis in Section 2 showed that the distribution of length of stay in hospital, the proportion of casualties referred to specialist hospitals and the use of the ambulance service is also likely to be different for home accident casualties which would have implications for health service costs. The balance of costs might be rather different for accidents involving larger numbers of children, even at the same level of injury severity. For example costs to carers, and hospital visiting, both of which are excluded from the estimates of road accident costs, may assume greater importance where casualties are children.

4.4 LOST OUTPUT

The method of calculating lost output used for road accidents is applicable to home accidents. Ideally, account should be taken of the difference in age distribution between home and road accident casualties, but for the purpose of deriving preliminary estimates this is not particularly important, because the area where age distribution of casualties is most crucial is in calculating lost output for fatalities, and the distribution of casualties between children and older people was shown in Table 4 to be similar for home and road accident fatalities.

4.5 ACCIDENT RELATED COSTS

Costs associated with the accident, rather than the casualty, are likely to be rather different for home accidents compared with road accidents. Damage to property is likely to be a more minor feature, the police will not generally be involved as they are with road accidents, but the fire and rescue service, which is currently excluded from road accident costings, may be more frequently involved.

Some further investigation is needed before it is possible to estimate these components of the cost of home accidents, so for the purpose of developing preliminary estimates, we have concentrated on casualty related costs.

5. ESTIMATES OF THE COST OF CASUALTIES IN HOME ACCIDENTS

5.1 FATALITIES

Given that there is some evidence that willingness to pay to avoid fatalities is the same in the home as on the road, the current best estimate of the cost of a home accident fatality is that it is the same as that of a road accident fatality. At June 1994 prices this is £784,090. This cost is made up of £272,690 in lost output, £510,880 for the value of avoidance of injury and £510 for medical costs.

5.2 NON-FATAL CASUALTIES

Data on home accident casualties are available from the DTI, which publishes estimates of the number of non-fatal casualties treated in hospital and the number of non-fatal casualties treated by General Practitioners. Recent estimates show these to be 2.3 and 0.8 million respectively (DTI, 1993).

As described in Section 2.1, home accident casualties treated in hospital were divided into groups according to the estimated severity of their injuries, using the injury state descriptors derived for road accidents. This allocation to groups took account of broad groupings of length of stay in hospital, whether the patient was transferred to a specialist unit, or referred to their GP or simply went home, as well as the nature of their injuries. To reflect the less severe nature of home accident injuries, for the casualties with 'slight' injuries, to calculate lost output it was assumed that half as many take more than a year to recover as for road accident casualties.

Whilst the allocation of casualties to groups could not take into account the detailed clinical assessment which was possible for the road accident patients, and therefore is not on a wholly comparable basis, it did mean that cost estimates could be derived, on the assumption that cost estimates for each injury state group would be similar, whether the patient had suffered a home or road accident. One element which it was possible to take account of was the lower use of the emergency ambulance service by home accident patients. In the calculations the average number of trips per casualty was adjusted to reflect the lower percentage of home accident patients brought to hospital by ambulance, shown in Table 7.

Table 11 shows the results of estimates of the casualty related cost of home accidents, applying costs in each injury state group and weighting them together in the proportions shown in Table 3; the total value of avoidance per casualty with 'serious' injuries is estimated at £28,830, or a third of the value of avoidance of a serious road accident injury.

In the case of injuries treated in hospital but defined for road accidents as 'slight', Table 11 shows that the total value of avoidance of injury is £3,920, or just over half the value for a road accident casualty.

TABLE 11

Estimated costs per home accident casualty: June 1994 prices

Severity	Lost output	Value of avoidance of injury	Medical & support	Total
Fatal	£272,690	£510,880	£510	£784,090
Serious	£2,878	£23,920	£2,020	£28,830
Slight (hospital treated)	£ 800	£2,660	£ 470	£3,920
Slight (GP treated)	£ 0	£120	£ 0	£120
Average non fatal	£1,040	£6,580	£ 680	£8,300
Average	£1,450	£7,330	£ 680	£9,460

Note: Values are rounded to the nearest £10

Casualties treated by GPs were assumed not to incur any costs associated with medical or support services, and not to take any time off work. The value of avoidance of their injuries was assumed to be the amount which would just make up for an injury involving minor cuts and bruises from the willingness to pay for road safety study (£120 at June 1994 prices).

The weighted mean for non-fatal home accident casualties treated in hospital is £11,140. Combining this figure with the £120 estimated for those treated by GPs produces a weighted overall average cost per non-fatal home accident casualty of £8,300, and per casualty (fatal or non-fatal) of £9,460.

To provide an indication of the difference in costs between accidents involving children and other casualties, and taking account of the variation in injury distribution with age among 'serious' home accident casualties, separate estimates of costs were made for children and adults, assuming that the costs vary only with injury state group, and not with age. It was also assumed that children's injuries do not result in a loss to the economy except for those who become permanently disabled. The total value of a 'serious' injury was estimated to be £24,440 for 0-4 year olds, £22,750 for 5-14 year olds and £31,530 for those aged 15 or over. Taking into account the varying proportions of 'serious' and 'slight' casualties in each age group treated in hospital, the weighted mean for non-fatal hospital treated casualties was calculated at £6,160 for 0-4 year olds, £6,280 for 5-14 year olds and £12,410 for those aged 15 or over.

6. DISCUSSION

This report has reviewed the methodology which forms the basis of road accident costing, assessed its applicability to home accidents and presented basic estimates of the cost of home accident casualties. The basic approach of dividing costs into those related to the casualty and those related to the accident was considered to be just as applicable for home accidents as for road accidents. However, the elements of accident related costs associated with home accidents were likely to be substantially different for home accidents, and so this element was not considered further in this report. The estimated values for casualty related costs were based on costs derived from recent surveys of road accident casualties. An attempt was made to take account of the differences between home and road accident casualties which are likely to affect the costs, such as the distribution of casualties between the injury states, using currently available home accident data.

There are some similarities between home and road accident casualties, but there are also some differences. Comparison of home and road accident casualties showed that similar proportions of each fall within the broad 'slight' and 'serious' injury severity categories overall, but within the 'serious' group home accident casualties tended to be concentrated within two of the less severe injury state groups. Assigning casualties to the injury state groups allowed basic cost estimates to be made but these 'injury states' were developed for road accident casualties and it was found that home accident casualties, and in particular children, may be more likely to suffer different types of injuries, for example burns and poisonings. These differences could not be taken into account in the injury states used.

The proportions of children and adults killed in home accidents was shown to be similar for home and road accidents but children comprise a far larger proportion of non-fatal casualties. This has implications for costings if for example, treatment and outcome varies with age.

In terms of use of medical services, the estimated distribution of casualties within the injury state groups also suggested that 'serious' home accident casualties were more likely to be treated as out-patients and to recover more quickly and completely. However, a comparison of length of stay in hospital for those that were admitted showed that home accident casualties were more likely to stay for longer periods overall, although children were more likely to stay for shorter periods compared with road accident casualties. In the case of 'slight' casualties the assumption was made that these casualties would also recover more quickly; in the calculations it was assumed that half as many took over a year to recover than was the case for road accident casualties.

Home accident casualties were less likely to be transported to hospital by ambulance within both the 'serious' and 'slight' groups. An attempt was made to take account of this by reducing the average use of the ambulance service (based on road accident casualties) to reflect the lower proportions of home accident casualties arriving by ambulance.

Basic estimates of the costs of home accident casualties have been presented but in order to improve the valuations of home accidents and casualties, and in particular those for children, a number of areas need to be addressed.

Firstly, a set of injury state descriptors derived from the injuries and outcomes associated with home accidents rather than road accidents is required. This would ensure that the descriptions are based on the injuries, lengths of stay in hospital and levels of disability more commonly associated with home accidents. It may be necessary to increase the number of categories representing the less severe injuries, and reduce the number of severe categories to ensure that casualties are spread between a reasonable number of more homogeneous and identifiable groups for which costings can be assessed. This may require new injury states, which may be of particular relevance to

children, such as those resulting from burns, to be identified.

Given a set of injury descriptors, road accident costs are estimated in three broad categories for each group: the value of saving casualties, the cost of medical and support services and the value of lost output. In the road accident costing methodology, the value of saving casualties is based on 'Willingness to Pay' for safety. This approach is suitable for estimating the value of saving death or injury in other contexts but some research is needed to assess whether the actual values derived for road safety are applicable to home safety. The value of saving home accidents may be considered lower if home accidents are perceived as being less severe and less traumatic, but the value of saving home accidents involving children may be considered higher. In addition to valuing injuries in each group, a value for death would need to be defined.

To value the cost of medical and support services more accurately, more comprehensive information on the use of such services by home accident victims is required. This would enable differences in for example, length of stay in hospital and use of specialist hospitals or units (e.g. children's hospitals or burns units) to be taken into account. For children in particular, the costs of carers and hospital visits which are not currently included in road accident costs may become more important elements of home accident costs.

For road accident casualties, these costs were estimated from in-depth interviews with casualties who attended hospital. As some estimates of the number of home accident casualties treated by GPs are available, the need for information on patients who do not go to hospital but who are treated by their GP should also be considered. The period of data collection would need to reflect likely recovery rates and levels of residual disability.

The methods used for calculating lost output are equally applicable to home accident casualties but the distribution of age will be different, particularly for non-fatal casualties, where the proportion of young casualties is higher and this should be taken into account in the calculations.

Accident related costs were not considered in detail in this report, since the costs attributable to home accidents are likely to be different from those which result from road accidents. The elements included in road accident-related costs; the cost of damage; the cost of insurance administration and the cost of police time are likely to be present, but much lower, in the case of home accidents. The cost of the fire and rescue service for which no value is estimated in road accident costs, may be more relevant.

The next stage of the work would therefore be to produce more detailed proposals on how the valuation of home accidents and casualties could be improved.

7. ACKNOWLEDGEMENTS

The work described in this report was carried out in the Safety and Environment Resource Centre of TRL. Home accident data was supplied by the Consumer Safety Unit of the Department of Trade and Industry.

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APPENDIX A: DEPARTMENT OF TRANSPORT DEFINITIONS OF SEVERITY

FATAL

Death which occurs within 30 days of the accident.

SERIOUS

Casualties who die as a result of their injuries more than 30 days after the accident.

All casualties who are admitted to hospital as an in-patient as a result of their injuries.

Casualties who are not detained in hospital but have any of the following injuries are also included: fractures, concussion, internal injuries, crushings, severe lacerations, and severe general shock requiring medical treatment.

SLIGHT

Casualties with injuries such as a sprain, bruise or cut which are not judged to be severe, or slight general shock.

MORE INFORMATION

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