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*This edition of Hazard outlines the major hazards related to non-traffic motor vehicle injuries for both children and adults, particularly carbon monoxide exhaust poisoning and injuries in off-street parking areas and makes recommendations for their prevention. This is an area which has been relatively overlooked in motor vehicle research although the fatalities equal approximately 26% of the road toll. Additionally there is an update on the risk of **baby walkers**.*

Non-Traffic Motor Vehicle Related Injuries

Virginia Routley

Summary

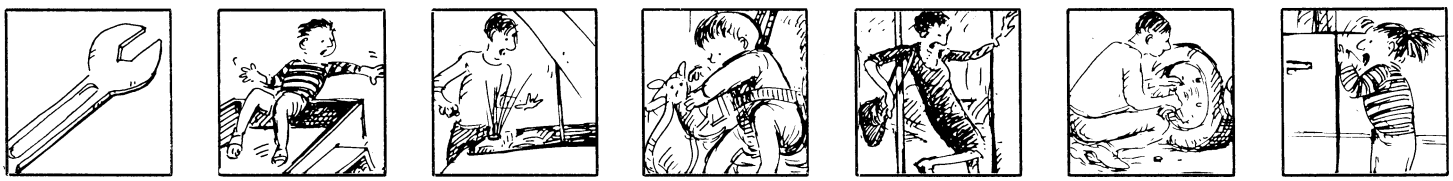
The Coroner's Facilitation System (Victoria) and the Victorian Injury Surveillance System (VISS) databases were examined for the most frequent and severe injury cases. In one year there were 130 deaths from motor vehicle related carbon monoxide poisonings and 14 from other non-traffic motor vehicle incidents such as motor cycle riding, motor vehicle fires and truck maintenance (CFS 90/91).

On the VISS database for the years examined there were 2047 adult and 1369 child cases, representing 3.8% of all adult and 2% of child emergency department injury presentations respectively.

The most frequent/severe causes of these adult injury presentations were related to the riding of motor cycles, mini or trail bikes on farms, motor cycle tracks or bush tracks (480); incidents which occurred during vehicle maintenance (402); vehicle doors (213); trucks (179), particularly truck drivers falling from trucks while loading or unloading; motor vehicle radiator scalds (84); buses (57), particularly while disembarking and boarding; hoists/lifts/jacks (25) and fire (20).

The most frequent/severe for children were finger jams from vehicle doors (358); incidents relating to motor cycles (313); trailers (127); vehicle parts (89), particularly collisions with tow or bumper bars and exhaust pipes; child pedestrians or cyclists in association with passenger cars in driveways (120); trucks and vans (74); ingestions of chemicals or medications while left in the vehicle (33) and fire (12)

There is a need for the prevention of such injuries and deaths but this task does not appear to come under the jurisdiction of any particular authority.



Introduction

'Non-traffic motor vehicle related injuries' as used here refers to those injury cases which involved a motor vehicle (including parts) ie a car, van, truck, trailer, horsefloat, caravan, motor bike or a form of public transport **and** were not a result of a crash on a public road, footpath, parking area or private road/ driveway beyond the fence line.

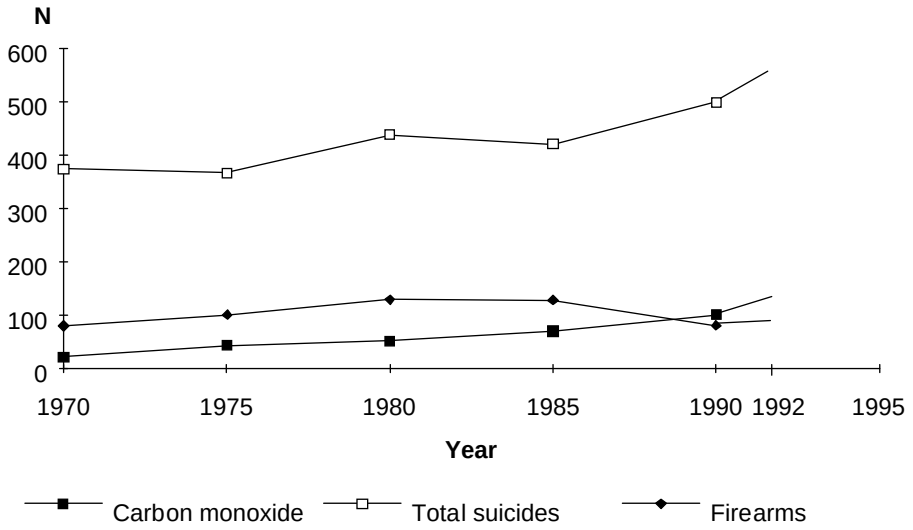
There is a significant gap in motor vehicle safety research in the area of non-traffic injuries. This issue of Hazard and a recent Monash University Accident Research Centre study of on- and off-road motorcycle related injuries to children and adolescents begin to address these issues. (Haworth, et al 1994)

Deaths on the Coroner's Facilitation Database (Victoria 1990/91) were examined and were almost exclusively suicides from carbon monoxide exhaust poisoning. These are discussed in detail below.

The 12 non-carbon monoxide motor vehicle deaths will be listed under their relevant factors within the Victorian Injury Surveillance System data analysis.

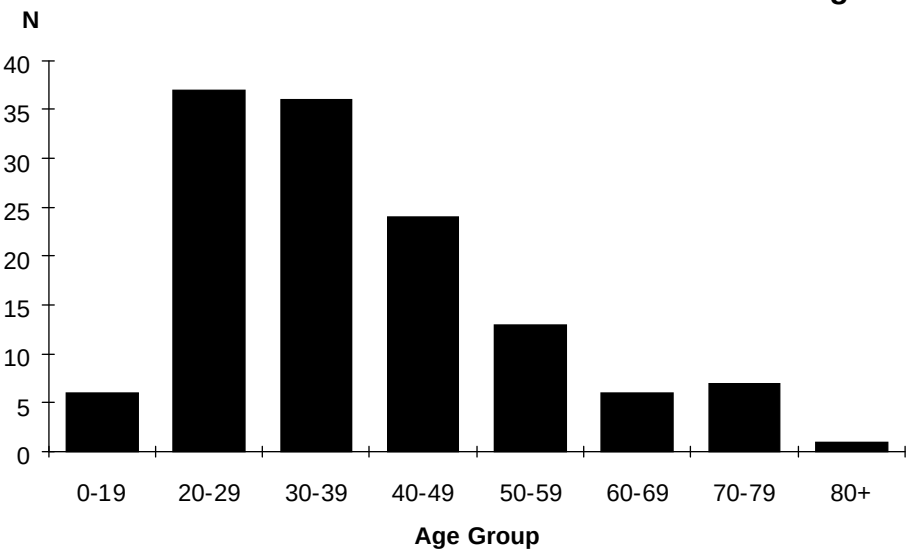
The Victorian Injury Surveillance System analysis covers victims who presented with injuries or poisonings to the emergency departments of 5 major Victorian hospitals with 7 campuses over various time periods between 1989 and 1993.

Selected Means of Suicide (Victoria) **Figure 1**



Source: Australian Bureau Statistics Microfiche, 1994.

Deaths from Carbon Monoxide Poisonings by Age Group **Figure 2**



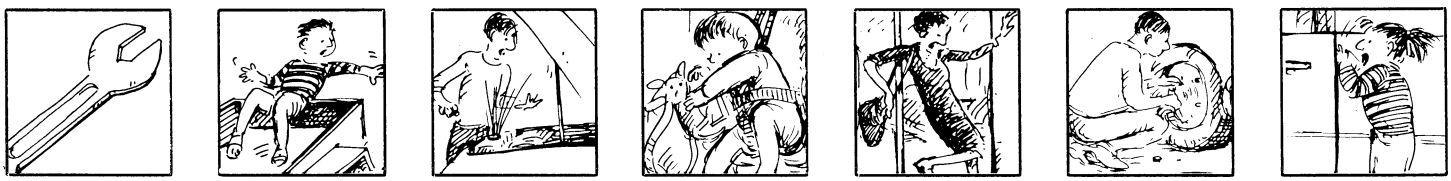
Source: CFS, Victoria 1990/91 (12 months)

Deaths (n=142)

Suicides from Car Exhaust Gassings (n=130)

Fatal carbon monoxide poisonings from car exhausts, all of which were suicides, accounted for the majority of non-crash motor vehicle deaths. They increased from 85 to 130 p.a over the 2 years of the Coroner's published data collection (1989/90-1990/91). The Australian Bureau of Statistics figures for Victoria over time show a steady increase from 22 in 1970 to 139 in 1992 (See Fig 1.)and in 1992 carbon monoxide poisonings were almost the major means of suicide - hanging/ strangulation was the major means, firearms the third.

Poisoning and deaths from carbon monoxide are caused by carbon monoxide binding to the 5 points of the haemaglobin molecule faster than oxygen thus not allowing oxygen to penetrate. A workplace is considered to become unsafe when carbon



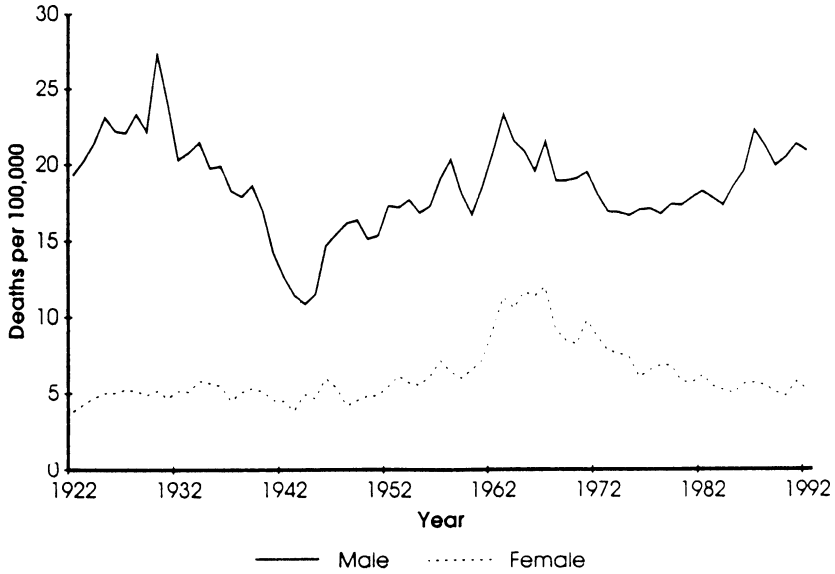
monoxide levels exceed 50 parts per million over an 8 hour average or 400 ppm in the short term (Workplace Australia, 1991). Typical motor vehicle exhausts range from above 45,000 ppm at a cold start to under 1,000 ppm at warm idle (EPA Motor Vehicle Section, 1994). Carbon monoxide is colourless, odourless and tasteless.

Male victims represented 87% of the Coroner's cases in the one year period 1990/91. The age distribution is shown in figure 2. This roughly reflects the overall suicide distribution by age although with a higher proportion in the 30-39 year age group and a lesser proportion in the 60-69 year age group. Although suicides from motor vehicle exhausts were concentrated in the 20-39 year age group they were the leading means of suicide between 30 and 50 years (CFS Unnatural Deaths data). The most frequent locations are shown in Table 1.

The home/garage accounted for over half of the carbon monoxide poisoning locations.

There were 8 cases on the Victorian Injury Surveillance System database of suicide attempts from carbon monoxide poisoning from car exhausts. All cases survived.

Suicide - Standardized Mortality Rates 1922-92 **Figure 3**



Source: Harrison et al. Australian Injury Prevention Bulletin NISU Issue 5, February 1994.

Environmental influences appear to have a role in creating and combatting suicide epidemics. The phasing out of coal gas and the introduction of petroleum gas in Australia indicated a fall in such suicides in Australia. This intervention has been well documented in Britain and other countries as reducing the overall suicide rate (Harrison,J, Moller,G, Dolinis,J,). The attributed decline in Victoria was from 54 suicides from gas in domestic use in 1970 to none in 1975 (ABS microfiche data). The widespread availability of relatively hazardous barbiturates coincided with high rates of suicide in the 1960's, especially for females. The restriction of these drugs coincided with a marked fall in suicide rates (Harrison et al) (See fig. 3). The tightened gun laws in Victoria since 1988 have seen a corresponding reduction in suicide by firearms - a reduction of 37% from 1985 to 1990 (See Figure 1).

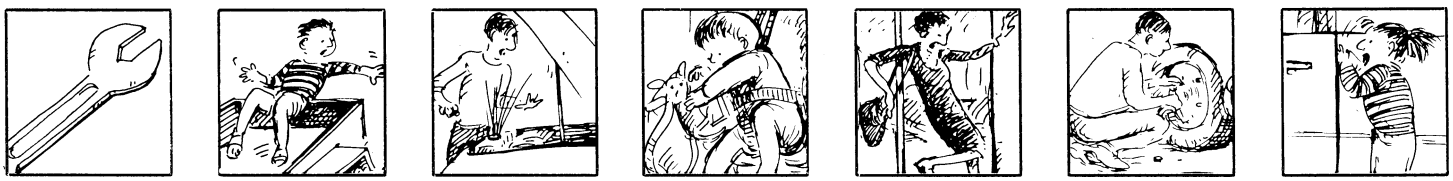
Since 1986 maximum allowable carbon monoxide levels in exhaust gases in Victoria have reduced from 24.2 gms/km to 9.3 gms/km (in reality usually less - EPA Motor Vehicle Section) due to catalytic converters and legislation making unleaded petrol mandatory in new vehicles. Such a reduction would appear to make suicide attempts longer to affect. This reduction in allowable carbon monoxide levels however has not been associated with reduced suicides from car exhausts.

Deaths from Carbon Monoxide Poisonings by Location

Table 1

	N	%
Own home - garden/garage	66	51
Public road	19	15
National or other park	13	10
Parking area	9	7
Other home - garden/garage	6	5
Other outdoor	5	4
Field/paddock	3	2
Other	9	7
Total	**130**	**100**

Source: CFS,Victoria. 1990/91 (12 months)



Environmental changes will clearly not alone eliminate suicide. Complex social, economic and psychological reasons underly the causes of suicide and the solutions for these presumably require a multi-faceted approach. Emphasis should be placed on males aged 20-24 years, the group for which suicides are increasing in proportion to others.

Cost

The cost of a death from car exhaust poisoning is calculated to be $703,256 based on injury costs per person from the Bureau of Transport and Communication Economics (Steadman and Bryan) updated to June 1994 by the Consumer Price Index. Thus the cost per year attributable to 130 car exhaust poisoning deaths is approximately $91.5 million. This represents a cost of $33.15 per year distributed over each of the 2.76 million motor vehicles in Victoria (Estimate June 1994, excluding motorbikes, caravans, trailers; Vicroads). If a device were developed which prevented 50% of these suicides, and it cost $34 the full costs would be recovered in just two years. Alternatively if the device cost $68, or if it prevented only 25% of these suicides the breakeven period would be four years. It seems likely that at least the second of these scenarios could be achieved.

Prevention

Three major design solutions are possible for the prevention (or minimization) of car exhaust carbon monoxide poisoning.

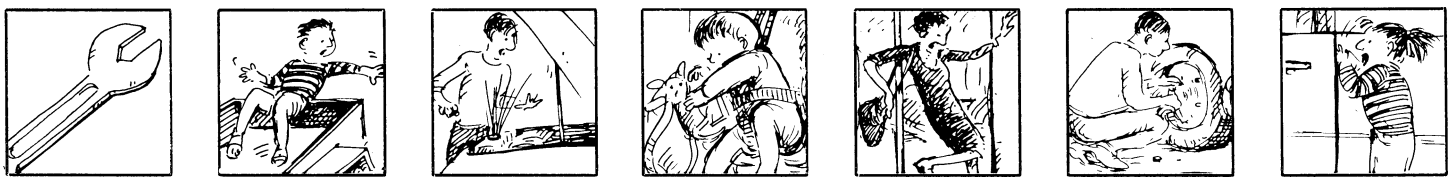
1. The mandatory incorporation into motor vehicles, involving a change in ADRs (Australian Design Rules), of a sensing device which monitors carbon monoxide levels and shuts down the engine when levels become death threatening. Such devices are available in the U.S for approximately $60. They would have the added advantage of identifying and preventing unintentional poisonings due to leaks of carbon monoxide from unsealed boots and rusted holes and access through open windows. It should not be set at a level such that the sensor could stop the vehicle in peak hour traffic or cold underground car parks where carbon monoxide levels are often high.
2. Design modifications to motor vehicles to impede common methods of carbon monoxide poisoning. Investigations should be undertaken into the most effective, cost efficient means to do this and modifications be made mandatory through incorporation into the ADR's. The potential for retro-fitting should also be examined. Design suggestions are available to appropriate authorities from VISS.
3. Further improvements could be made in engine design and in catalytic conversion techniques to complete the combustion process and thereby virtually eliminate carbon monoxide emissions. (Vehicle Emissions Laboratory Group, Environmental Protection Agency, Victoria)

Factors involved in non-traffic motor vehicle related injury

Table 2

Cause of Injury	Children (under 15)		Adults (15 and over)	
	% Total Presentations (N=1369)	% Presentations Admitted	% Total Presentations (N=2047)	% Presentations Admitted
Motorcycles (incl. trail bikes)	20	30	23	19
Doors	26	9	10	5
Radiators	-	-	4	2
Vehicle parts (other)	15	17	22	12
Trailers	9	25	6	14
Trucks (incl. vans)	6	27	9	17
Passenger cars in driveways (excl. vehicle doors)	9	28	2	10
Buses	1	14	3	12
Hoists,lifts,jacks	-	-	3	15
Automotive tools or access. (other)	-	-	2	5
Flame/fire/smoke	1	92	1	37
Chemical ingestions	2	44	-	-

VISS: Children- RCH,WH,PANCH (89-93);
Adults- RMH,WH,LRH (2 yrs), PANCH (1 yr).



Victorian Injury Surveillance System Data

Non-traffic motor-vehicle related injury data are unavailable in most major injury databases. Apart from deaths (CFS 1989/91) emergency department injury surveillance is the major source of this information.

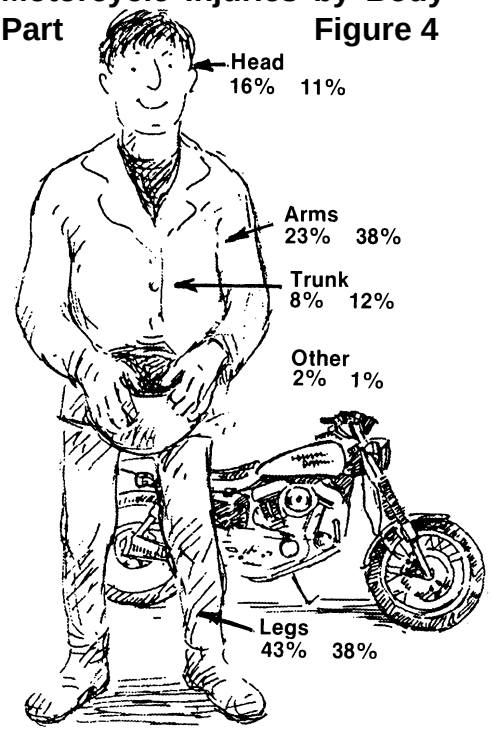
The children's injury data used here refer to children aged under 15 years who presented to the Royal Children's Hospital, Preston & Northcote Community Hospital and Western Hospital between 1989 and 1993. Adult data has not been collected for as long a period as has children's data and the hospital collection dates are more varied. The adult data as referred to in this analysis is from the Latrobe Regional Hospital (1/7/91 to 30/6/93), the Royal Melbourne Hospital (1/3/92 to 28/2/94), the Western Hospital (1/1/90 to 31/12/92) and Preston & Northcote Community Hospital (1/3/92 to 28/2/93) ie LRH, RMH, WH, (all 2 years), PANCH (1 year).

There were 2047 adult and 1369 child cases. It should be borne in mind that due to differring periods and sources of data the numbers of adult and children's cases cannot be numerically compared. The emergency department presentation figures in Table 2 are therefore shown as percentages to enable such comparisons.

Motorcycle (incl. Trail Bikes) (480 adult, 276 children)

For adults these injuries were most frequent at 15-19 years, for children 13-14 years. They occurred in a variety of locations - farms, motocross or bush tracks (as found by the motorcycle study Haworth et al, 1994). Eighty-seven percent for adults were motorcycles, two thirds for children, the remainder mini/trail bikes.

Motorcycle Injuries by Body Part **Figure 4**



Children N=354 injuries, Adults N=634 injuries. *VISS*

For adults, injuries were usually lacerations, bruising and inflammation, particularly to the upper and lower limbs; for children they were fractures, particularly to the leg (59% of fracture cases), radius/ulna and clavicle and concussion. (See Figure 4)

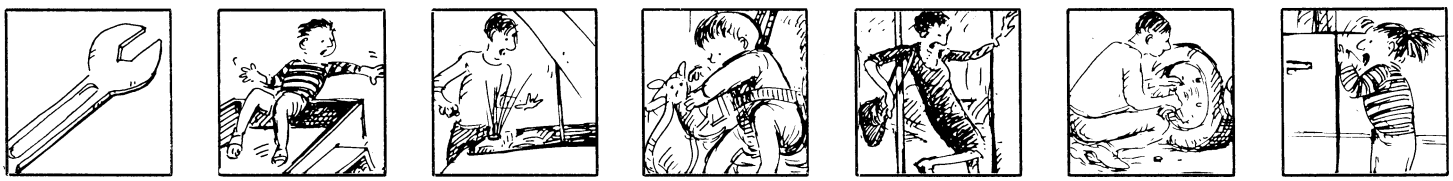
Usually the injury could be attributed to the rider losing control, often on hitting obstacles such as rocks, ditches, animals or fence posts. Injuries were more serious for children and trail bike riders, with 27% of child motorcyclists and 30% of trail bike riders being admitted to hospital. For adults the figures were 18% of motorcyclists and 25% of trail bike riders. Only one third of adult riders and two thirds of children noted having worn safety devices such as a helmet (44% children, 20% adults), boots or body armour.

There were 5 motorcycle deaths on the CFS database 1990/91.

Prevention

1. Helmets be made mandatory for off-road riding to reduce the frequency of head injuries. Further investigations of helmet performance (including retention) should be undertaken to attempt to reduce head injuries.
2. Motor cyclists be educated about the value of protective clothing and be encouraged to wear it.
3. Motorcycle riding by very young riders (perhaps under 8 years) should be discouraged because of the likelihood of insufficient development of motor co-ordination.
4. An appropriate government authority (or authorities) should take responsibility for motorcycling safety off-road.
5. Further investigations into improving protection for the limbs is warranted because of the high incidence of limb fractures.
6. That riders be informed of the very high risks associated with riding a different motorcycle for the first (or second) time, even if they are experienced riders. The risk of riding a different motorcycle could be minimised by riding in an area free of obstacles, riding more slowly and wearing protective gear.
7. Guidelines on minimum rider heights (for various styles and sizes of motorcycles) and minimum ratio of weight of rider to weight of motorcycle be developed and distributed to retailers to advise intending purchasers and to off-road motorcycle clubs.
8. That parents be made aware through retailers and off-road motorcycle clubs that slowing down motorcycles for young riders will not eliminate injuries warranting hospital admission.

(Haworth et al, 1994)



Doors (358 children, 213 adults)

The majority of vehicle door associated injuries occurred in driveways, parking areas and public roads. In 85% of child and half of adult cases the victim was caught in the door, the remaining cases involved hitting against or being hit by the door. For adults injuries most often occurred on getting in and closing the door. For children, injuries were twice as likely to occur on getting out of the car. Three quarters of injuries for children and half for adults were to the fingers, particularly bruising, crushes, lacerations and fractures. For children, the 2-4 year old age group was over-represented (40% of child cases).

Twelve percent of cases of children's finger jam injuries were admitted to hospital. Such injuries in the home are usually more severe (one third admitted). That there is a lesser severity in motor vehicles may be because the children usually catch themselves in the closing rather than the hinge side of the door where the injuries tend to be more severe.

Prevention

1. Parents should be reminded of the injury potential of car doors and that finger jam injuries are a frequent cause of non-traffic motor vehicle injuries.
2. Motor vehicle manufacturers should be encouraged to examine their door designs to determine whether it is possible to make them less injurious to fingers caught while closing them.

Radiators (84 adults)

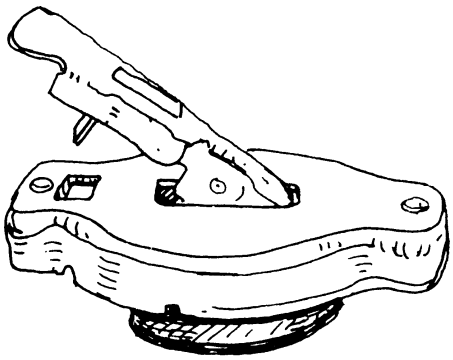
These cases were almost all partial thickness scalds to adults from radiator hot water (87% cases) and/or steam (21%). The forearm, face and scalp, wrist, chest and abdomen were the most frequently scalded body parts. Most patients were treated with either referral or review in the emergency department.

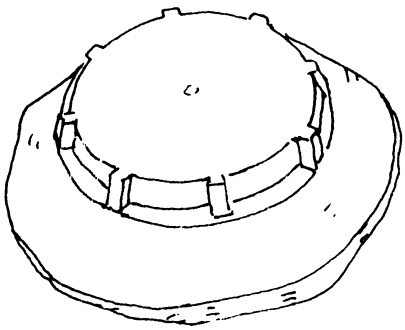
Scalds usually occurred on removing the radiator cap (only 2 mentioned doing this with the assistance of rags) (n=42), the radiator cap being blown off when the vehicle was undergoing maintenance or the bonnet opened (n=13) and the radiator itself or the hose exploding (n=9).

Prevention

1. Wait for the vehicle radiator cap to cool down sufficiently to touch. Dropping cold water over the radiator tank (taking care not to spill it over the remainder of the engine) will speed up temperature reduction. Release to the first click, remove if there is no pressure.
2. Devices such as safety pressure caps and magnetic deflectors are examples of safety products which have appeared on the market at various times to cater for the problem of radiator cap scalds (See fig. 5). A product offered at a competitive price which accommodates most car models would seem very attractive. The possibility of routine incorporation or the wider availability of such safety devices should be investigated.

Countermeasures for Radiator Scalds Figure 5





Vehicle parts (other than radiators, doors) (204 children, 445 adults)

The adult injuries occurred most often to men in the 20-29 year age group (37% cases). One third occurred in the victim's home garden, the remainder on public roads, factories/warehouses and parking areas. Over one quarter were injured on duty at work and one third during vehicle maintenance. Injuries were most often caused by being grazed/abraded/ lacerated (27%), hit by (23%), hit against (22%) (usually falls) or caught in or between (14%). Almost half the injuries were to the fingers and hands (45%), particularly lacerations, fractures and bruising.

Forty percent of the 124 persons injured on the job were vehicle mechanics. Others were truck drivers or panel beaters (each 8%).The vehicle parts which most frequently caused injuries were wheels/tyres (n=28), bonnets (25), gear boxes (24), windows (18), exhaust pipes (13) and windscreens (12).

One half of wheel/tyre injuries occurred during tyre changes but there was no particular pattern in their causes of injury. Bonnets most frequently caused injury by falling onto heads (n=8) or hands (n=6) during vehicle maintenance. Gear boxes most frequently caused injuries, particularly hand lacerations, when they were dropped. Window associated injuries were usually a result of violence, either self-inflicted (n=6) or assaults (n=5). eg 'Sitting in car. Hit by man with baseball bat. He smashed window.' Six windscreen injuries were also a result of violence (self-inflicted), another 5 occurred during fitting or removal. Lacerations were the most frequently occurring injury.

There were two adult deaths on the CFS database (1990/91) where victims were hit by tyres or wheel parts while changing truck tyres.

For children, mostly under 5 years, vehicle parts injuries were caused by collisions with tow or bumper bars and exhaust pipes. Injuries were most often lacerations and bruising to the face and scalp and fingers. Another 18% of cases were either burns as described under the flame/fire/smoke category (n=7), were from exhaust pipes (n=9), from boiling water from radiators (n=2) or from playing in the car with a car cigarette lighter thus giving themselves contact burns (n=3).

Injuries from tow bars usually occurred when the victim was playing in the vicinity of the vehicle and tripped or fell against the tow bar (n=10) or when they were getting out of a rear door in a station wagon or 4WD and fell onto the tow bar (n=7). Bumper bar injuries usually occurred when the victims were playing in the vicinity and fell, hitting against the bumper bar (n=7). These injuries were all relatively minor.

Prevention

Adults:

1. The majority of modern car bonnets are held up with a gas strut which ensures that they close gradually. However if the counterbalance springs are broken or the gas strut has lost its pressure the bonnet may close abruptly and injuries may result. Vehicle owners should therefore ensure that these mechanisms are in good working order.
2. Persons working on older cars should ensure that the rod is securely in the hole provided.

Children:

1. Design of a retractable towbar.

Trailers (132 adults, 120 children)

These injuries most often occurred to boys in the 2-4 year age group and men aged 20-39 years. Two thirds occurred in the victim's own home, 10% in the driveway. In one quarter of cases the victim fell, in another quarter the victim was hit by the trailer and in 13% of child and 21% of adult cases the victim, in particular their fingers, were caught in or snagged by the trailer. The most frequent injuries were face and scalp lacerations for children (18% of cases) and hand and finger fractures, lacerations and crushes for adults.

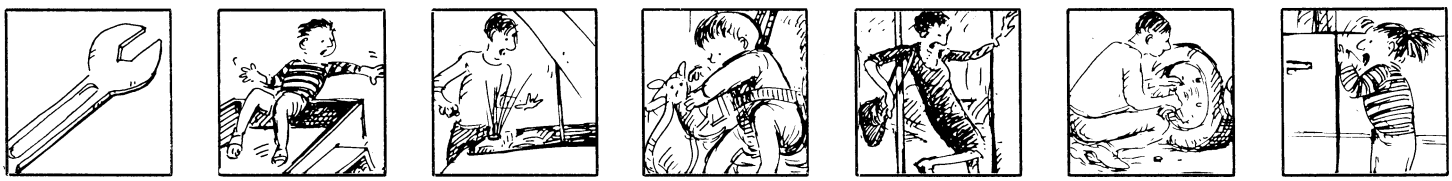
In one quarter of child cases the victim was admitted to hospital, 14% adult, and these more serious cases were most often when the victim was hit by the trailer eg *'Playing in backyard. Trailer dropped onto foot'* or caught in or between the trailer eg *'Older sibling closed tailgate of trailer on finger'; 'Crushed finger between tow bar and trailer'.*

Trucks and Vans (179 adults, 74 children)

Truck related injuries differed for adults (n=179) and children (n=74). The majority of adult injuries occurred in areas of production, particularly in factories/warehouses. Seventy percent occurred while on duty at work. Injuries were most often ankle sprains/strains; face, scalp and finger lacerations and crushes. Heavy trucks over 3 tonnes were more often involved (51%) than light trucks or utilities (36%). Truck drivers represented over one third of injured persons, one half of those injured on the job. At least 40% were falls - either falls from the truck or slips. The injuries most often caused from falling were ankle and knee sprain/strains and lower arm and rib fractures.

The child cases were most often cases of children playing on the truck, van or utility and falling off. They were most frequently boys aged under 10 years. They most often occurred on a public road or driveway and victims most frequently incurred bruising and lacerations to the face and scalp. One quarter of victims, particularly those with fractures and concussion were admitted to hospital.

These severe injuries could be attributed to falls from a truck over one metre (n=6 admitted) and falls from the outside of a moving vehicle (n=3) eg 'Standing in back of utility truck. Fell onto dirt roadway'.



The CFS (1990/91) recorded 2 truck related deaths other than those related to tyres discussed under vehicle parts.

Prevention

Adults:

1. Mechanized loading and unloading devices eg forklifts.
2. Slip resistant treads on the steps.
3. Redesign of the placement of the steps, of the spacing between the steps and of the positioning of the grab rails in relation to the steps. (Haworth,N, 1994)

Children:

1. Children should not be left to play in trucks unattended.

Passenger cars in driveways (excl. vehicle doors) (120 children)

The most potentially serious group of these were children or cyclists who were hit by a passenger car in the driveway (n=47). Children who were hit were most often aged one or two years. Injuries were most frequently to the lower limbs, particularly the foot. They were most often bruising or abrasions. They were often caused by the driver reversing along the driveway (n=22) and not seeing the child behind the car eg. 'Standing behind dad's car when dad drove off and hit the child.' One quarter were admitted to hospital and one of the children died later in hospital. Boys were injured twice as often as girls.

The remaining injury cases in this category were mostly falls of various kinds. The most frequently occurring happened on getting out of the car (n=17), riding bicycles and running into the cars (n=9), playing on the top of the vehicle and falling off (n=7) and hitting against the tow bar (n=7).

Hoists, lifts, jacks, ramps (28 adult cases)

These injuries usually occurred either when the motor vehicle moved or fell (n=12) or the jack etc fell or failed (n=11). Examples were 'Jacking up car with air jack. Car slipped. Hand wedged between jack and car', 'Changing front tyre. Checking brake line. Jack slipped. Car fell on head.' Injuries were most frequently crushes and fractures to the hand (including fingers). Injuries most often occurred in the context of vehicle maintenance in the backyard or driveway. Only 3 incidents occurred while the victim was on the job ie injuries were usually to the amateur mechanics.

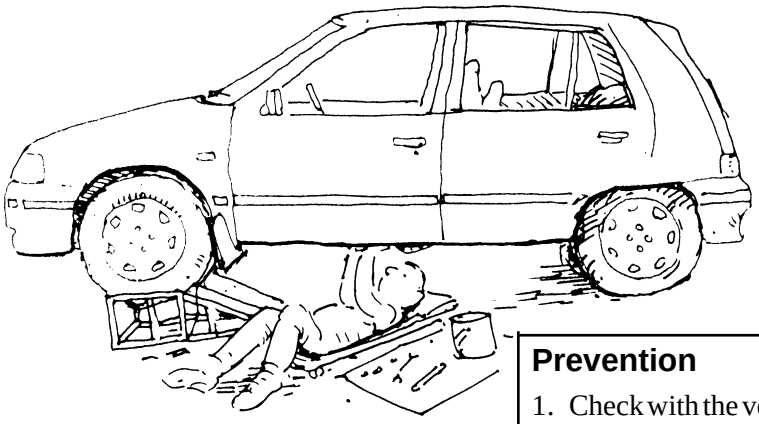


Figure 6

Prevention

1. Check with the vehicle handbook where the jack is to be positioned.
2. Do not get under a vehicle that is jacked up unless correctly supported with chassis stands.
3. Use drive-on ramps in preference to jacking up.
4. Jacks should be of good quality and regularly oiled and maintained.

Prevention

1. Development of a device which detects motion behind a vehicle when reversing eg a device currently being developed by Engineering students at Wollongong University.

Buses (57 adult cases)

These cases most often occurred while getting off the bus (n=18), on boarding (n=12), on standing when the bus started or suddenly stopped (n=8), during vehicle maintenance (n=6) or assaults (n=4). Injuries were most frequently ankle sprain/strains, the more serious were fractures to various body parts. Victims injured while disembarking usually injured themselves by falling and/or twisting their ankle eg 'Walking out of bus. Slipped from steps of bus. Twisted ankle'. Those injured while boarding usually did so by slipping on the steps.

Automotive tools or accessories (other) (37 adult cases)

These injury cases were equally divided between the workplace and do-it-yourself vehicle maintenance. Only 3 victims mentioned using a safety device at the time of injury. The most frequent injuries were lacerations to the hand (n=7) and metacarpal fractures (n=6). Spanners slipping were the most frequent occurrence (n=16). Injuries from spanners were most often to the hand - lacerations and metacarpal fractures. None were sufficiently severe to be admitted to hospital eg 'Working on car with spanner, spanner slipped. Hand hit hard against car'.

Other injuries were caused by the wheel brace/lever during a tyre change (n=5), usually by springing back and hitting the patient.

Prevention

1. Use the spanner appropriate to the job with a minimal use of adjustable wrenches (shifters).
2. Use good quality spanners which are chrome plated and therefore less likely to fracture and have handles moulded to the shape of the grip.
3. Have minimal oil on the hands when using spanners.

Flame/fire/smoke (21adults, 12 children)

Approximately half the adult cases involved petrol eg 'Pouring petrol on carburettor to get car started. Car backfired, caught fire' (4 similar cases), 'Driving car. Petrol fumes ignited car. Hurt by flames'. Injuries were more frequently partial thickness burns to the face and scalp. As normally occurs where flames are involved the injuries were relatively serious (one third admitted to hospital). Approximately half occurred during vehicle maintenance.

With children these injuries, although few in number, were particularly severe since almost all were admitted to hospital. Five of these cases, in two incidents, were attributable to cigarette lighters (type not specified) and the children were particularly restricted being strapped in their car seats. Another 2 cases, in one incident, involved the car catching fire when the ignition was turned on. One of these children later died (CFS 1990/91). There were three incidents associated with motor bikes and petrol.

There were 2 adult suicides on the CFS (1990/91) from setting fire to cars and one death from burns when a gas tank from a motor vehicle exploded.

Prevention

Adults:

1. The petrol pump should pump up the petrol naturally. If it does not do this there is a problem with the system.
2. If it is deemed necessary to assist the car to start by pouring petrol on the carburettor it must be done without the engine turning over and pouring no more than a thimble full at a time directly down the throat of the carburettor.

Children:

1. Children should not be left unattended in motor vehicles, particularly where they can reach matches or cigarette lighters.
2. Petrol in motorbike maintenance should be treated with extreme caution.

Drugs and Medications (25 children)

These cases were most often boys aged under 3 years, and were often serious with 44% admitted to hospital. Victims most commonly, when the poisoning incident occurred, were playing in a motor vehicle parked in the backyard or driveway, presumably unattended (n=12). Drugs and medications represented 80% of the substances ingested. They usually accessed the poisons, particularly child medications and paracetamol from the glove box or a bag left in the vehicle.

Prevention

1. Glove boxes containing medications eg amphetamines in Dad's truck, should be locked.
2. Children should not be left unattended in motor vehicles, especially to play.
3. Medications loose and in bags should be kept out of children's reach.

Conclusion

The area of non-traffic motor vehicle injuries is one which has been neglected relative to traffic related injuries. This becomes particularly apparent in the case of carbon monoxide car exhaust poisonings which are equal to approximately 23% of the road toll. There is a need for an appropriate authority/authorities to take responsibility for the prevention of the non-traffic types of motor vehicle injuries and deaths outlined in this article.

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Professor Helen Hermann, Melbourne University Department of Psychiatry for comment, Karen Ashby, VISS, for assistance with analysis and Phil Waller Motors.

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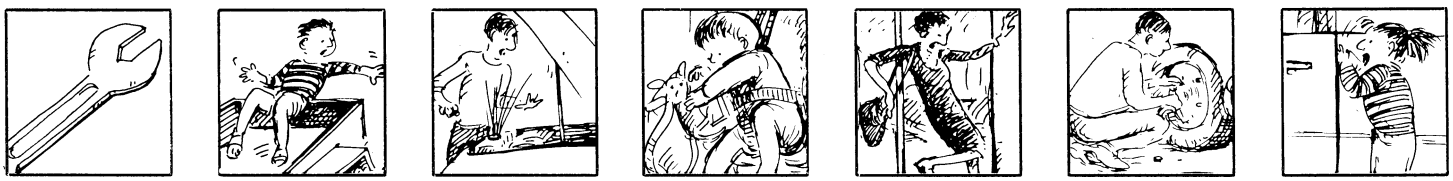

Injuries and Vehicle Damage in Off-street Parking Areas

Narelle Haworth, Accident Research Centre
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Parking is an important part of the total transport system. It provides an interface between the movement of vehicles on roads and access to land uses. Unlike major road crashes, most drivers have either seen or been involved in a collision in a parking area. These collisions are accepted as a part of daily life. The general perception is that most collisions are very minor and that very few injuries occur. The small amount of research that has been conducted suggests that this perception may not be accurate. While many collisions are not severe, a study of four off-street parking areas by the NRMA (Johnston, 1989) showed that the average cost of vehicle damage in crashes that were reported to Police was $8,500 (1988 dollars).

In the ACT in 1986 to 1989, crashes in parking lots comprised between 12.8% and 15.9% of all reported crashes (Yue and Young, 1992). Injuries occurred in less than 1% of these crashes, and largely involved pedestrians. However, both Hagan (1988) and Brindle (1983) consider that the low number of pedestrian injuries in parking lots does not reflect the very low severity crashes and the "non-physical conflicts between vehicles and pedestrians". Brindle (1983) states that: "Pedestrian security is not necessarily measurable (or at least adequately reflected) by small-magnitude numbers of pedestrian casualties in centres". He notes that

> *if safety was really a consideration in new shopping centres planning then there would be better planning for pedestrians at the doorways of car free shopping centres, which almost invariably open onto major circulatory roads, and in the car parks of such centres. If anything, present design philosophy tends to favour traffic bustle at the centre doorways, to draw intending shoppers past the entrance before they park, and to emphasise the contrast with the traffic-free environment inside.*

A study of vehicle-vehicle and vehicle-pedestrian conflicts (potential collisions) at a supermarket car park in Melbourne (Yue and Young, 1992) showed that, overall, the number of pedestrian-vehicle conflicts was just over a third that of vehicle-vehicle conflicts. However, in front of the shopping centre entrance, there were more pedestrian-vehicle conflicts than vehicle-vehicle conflicts. Most of the conflicts were between pedestrians and vehicles driving around, rather than vehicles in the process of parking or unparking. These vehicles were travelling at higher speeds (Young 1988 found speeds of about 20-30 km/h in this situation, although some reached 60 km/h, compared with 13-18 km/h when searching for a parking place) and so the conflicts posed a higher risk of collision, and hence injury.

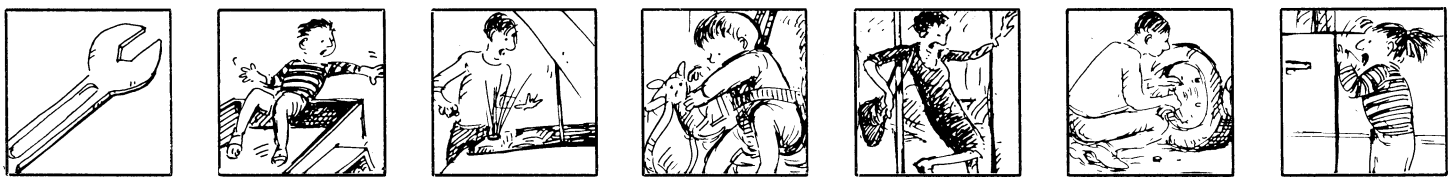
VISS data on injuries in parking areas

An analysis of the VISS database found 914 persons had presented at Emergency Departments with injuries sustained in parking areas, of which 109 were transferred or admitted. While some of these injuries were not related to transportation, e.g. stabbings, transportation was the activity being undertaken in 413 cases (49 admissions). While most of the concern about injuries in parking areas has focussed on pedestrians, the analysis showed 230 car occupants and 62 cyclists injured, in addition to the 99 cyclists. Of the persons injured in parking areas, 82 were on-the-job.

Unfortunately, while these data suggest that injuries in parking areas require further attention, they give little information to guide countermeasure development. At the basic level, it is not known whether the injuries occurred while the vehicle was driving in the circulator roads, or while parking, or while unparking. It is unclear to what extent reversing, or visibility restrictions may have contributed to the occurrence of collisions. Follow-up studies or surveys have the potential to provide these data.

Improving safety in parking areas

Given the lack of good quality data about collisions in parking areas, some researchers have opted to use a theoretical approach to prediction of

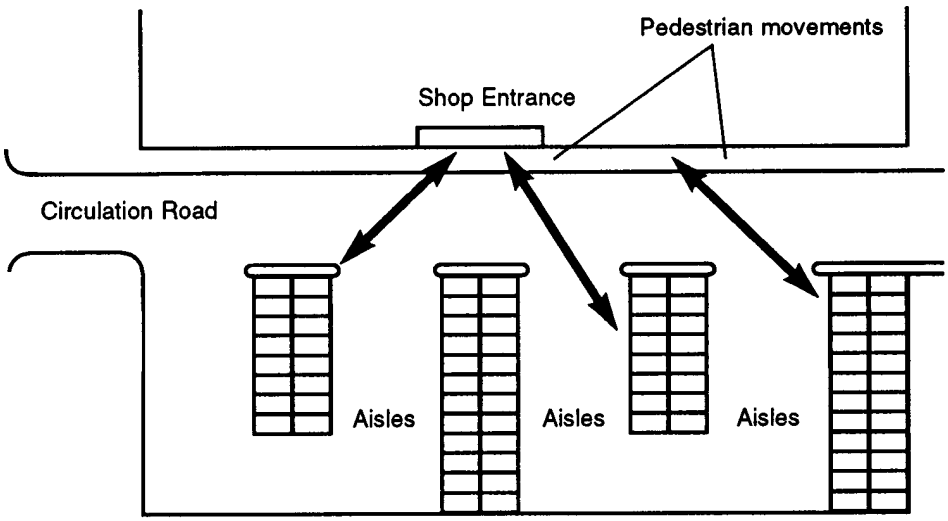


risks of collision and injury. Yue and Young (1992) have developed a computer model which predicts the patterns of conflicts, given the particular characteristics of the parking area, the vehicles and the pedestrians. This is being used to investigate potential design faults in parking areas. The technique can be used to isolate problem areas in parking areas and remove or improve these problem areas to increase safety and reduce inconvenience to users.

The use of a "Safety Audit" during the design process may be a useful tool to detect flaws in the design of a parking system. It may include considerations of obstruction of sight distance by parked vehicles, the impact of parking controls, turnover of parking, etc.

Standards and guidelines exist for the design of off-street parking areas. The Guide to Traffic Engineering Practice (NAASRA, 1988) states that

> *An important consideration in the design of parking facilities is the interaction of vehicles and pedestrians. Separation of these user groups is advantageous but not always possible. Parking networks should, however, be designed to reduce conflict in terms of exposure to risk and the relative speed and vulnerability of different user groups. Pedestrian movements should be minimised on circulation roads since these primarily involve faster moving vehicle traffic....Raised pedestrian footpaths are sometimes used in large parking lots to separate rows of cars and to provide favourable walking conditions. However, people walking to and from cars often use aisles, and such footpaths may be under utilised.*
>
> *In general the parking layout should encourage walking along aisles rather than across them. Footpaths may be useful where there are large pedestrian flows (eg from bus stations or satellite parking stations). pp.30-31*



High Pedestrian Vehicle Conflict

The level of conflict in parking systems goes further than just the consequent collisions. It can result in inconvenience and frustration to drivers and pedestrians. The ever improving physical environments within shopping, office, industrial and educational establishments can be enhanced by improving the parking systems providing access to them. Appropriate parking area designs and investigation procedures that can reduce the risk of collision and injury and improve the quality of the parking environment are required. It is important that the magnitude of the problem be determined and that rigorous procedures be developed to ensure that injury and property damage are minimised.

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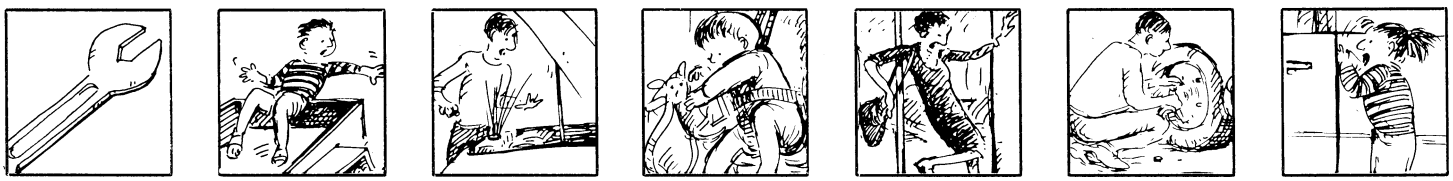


The Risk of Baby Walkers: an update

Fiona Williams

A. James

Introduction

This article provides further evidence, in the form of risk estimation, to support the recommendation for a product ban on babywalkers. Relative risk ratios for injury are compared for three types of nursery furniture: baby walkers, prams/strollers, and high chairs.

Injury Data

Data analysis was undertaken on cases of injury to infants aged 6-11 months (incl.) reported to the Emergency Departments of 3 metropolitan hospitals (Royal Children's Hospital, Preston and Northcote Community Hospital and Western Hospital) from 1989-1993. The age group 6-11 months (incl.) was chosen as baby walkers are most commonly used, and most injuries associated with the product occur, in the latter half of the child's first year of life.

A total of 2435 cases of injury were reported to the 3 hospitals for children in the specified age-groups and time period. Two hundred and sixty-eighty cases, where injury was associated with the 3 types of nursery furniture, were reported: baby walkers (115 cases), prams/strollers (86 cases), and highchairs (67 cases). Thirty-six of these were admitted: 15 cases associated with baby walkers, 13 with prams/strollers, and 8 with high chairs. One fatality was reported following injury associated with a pram/stroller.

Burns and fractures appear specific to babywalkers and high chairs. The distribution of injuries is otherwise very similar within each of the product groups. It needs to be emphasised, however, that the risk of injury overall is much greater for babywalkers than for the remaining two products (as discussed in later paragraphs).

Causes of injury

Stairs/steps were specific to injuries associated with baby walkers: baby walkers (40%); prams/strollers (5%); high chairs (0%). This is not surprising given that the babywalker allows increased mobility of the child.

Exposure Data

The 'Safety in the Home' survey, conducted in Melbourne by the Australian Bureau of Statistics in November 1992, provides valuable exposure data on the presence of particular products in households surveyed. From the sample interviewed, it is estimated that 46,700 households in the metropolitan area include at least 1 child under the age of 12 months. Of these 46,700 households with a child under 12 months of age: 13,900 (30%) possessed a babywalker, 45,400 (97%) possessed a pram or stroller, and 30,400 (65%) possessed a high chair.

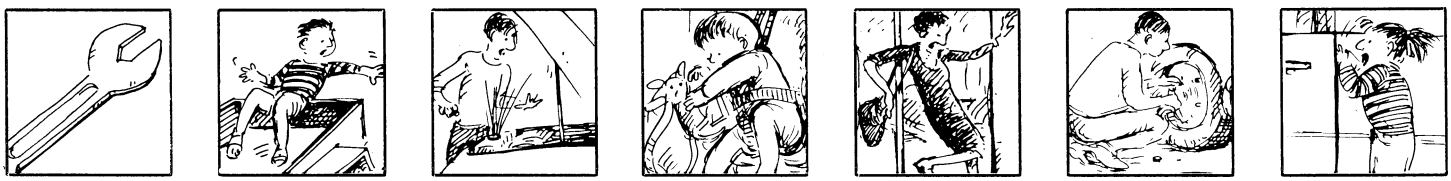
Determination of Risk

Determining risk is essential for establishing whether a public health problem is associated with the use of a particular product; assessing the magnitude of such a problem; and for assessing the need for and appropriateness of particular interventions. Determining risk requires computation of risk from sample injury data relative to exposure data.

In this study, the population areas from which injury data is collected approximates to a subset of the exposure data and thus the absolute risk of each product cannot be computed without making extrapolations. However, it is the comparison of the three products and thus the risk of injury relative to the other products that is required.

The nature of injury

Injury Type	Babywalkers	Prams /strollers	High chairs
Bruising	31%	44%	42%
Concussion	10%	12%	13%
Burns	17%	0%	4%
Fractures	4%	8%	16%
Most affected body region	Head (77%)	Head (83%)	Head (74%)



Thus if there are:

- *115 injury cases due to babywalkers and 13,900 baby walkers in the metropolitan area in this age-group
- *86 injury cases due to prams/ strollers and 45,400 prams/ strollers in the metropolitan area in this age-group
- *67 injury cases due to high chairs and 30,400 high chairs in the metropolitan area in this age-group

then: t**he risk of injury from babywalkers is:**

- **4.4 times higher than the risk of injury from prams/strollers**
- **3.8 times higher than the risk of injury from high chairs.**

Injury Prevention

In the 6-11 month age-group, it is clear that the risk of injury associated with baby walkers far exceeds the risk of injury associated with prams/strollers and high chairs. In assessing the risks of a product, the benefits of such a product also need to be taken into account. In the case of baby walkers, there appears to be no demonstrated benefit (Greensher & Mofenson, 1985) but there do appear to be indications of that use of a babywalker may adversely affect the development of gait (Crouchman 1986, Kauffman & Ridenour 1977) and motor development generally (Simpkiss & Raikes 1972).

The results presented further support the argument that babywalkers are an unsafe product and should be the subject of either a product ban, or other effective mechanisms, to substantially reduce infants' exposure to this unacceptably high risk.

** These figures are under-estimates, accounting only for that part of the metropolitan area of three metropolitan hospitals. The injury data are collected over five years and the expsoure data over one year. However, these points should not affect the risk calculations.*

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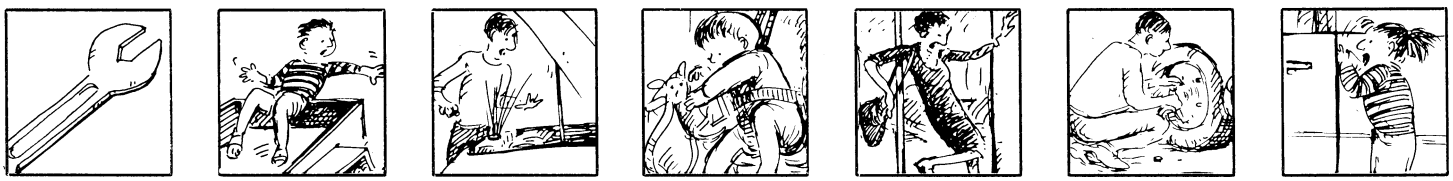

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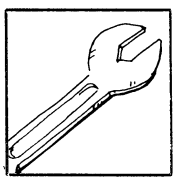


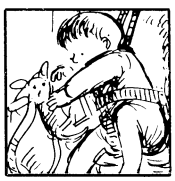


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How to Access VISS Data:

VISS collects and tabulates information on injury problems in order to lead to the development of prevention strategies and their implementation. VISS analyses are publicly available for teaching, research and prevention purposes. Requests for information should be directed to the VISS Co-ordinators or the Director by contacting them at the VISS office.

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Participating Hospitals

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Latrobe Regional Hospital (Traralgon and Moe)

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Coronial Services

Access to coronial data and links with the development of the Coronial Service's statistical database are valued by VISS.

National Injury Surveillance Unit

The advice and technical back-up provided by NISU is of fundamental importance to VISS.

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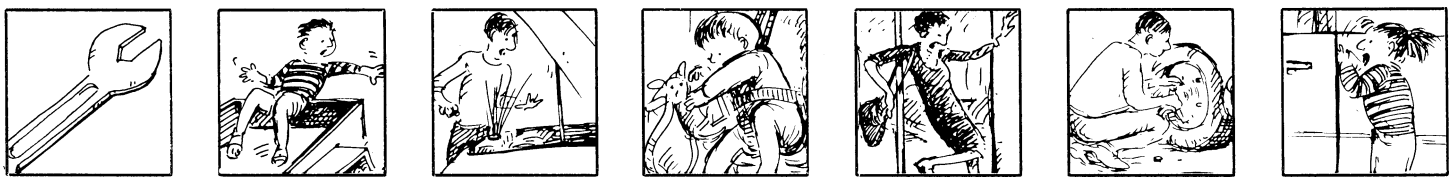

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