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FEDERAL OFFICE OF ROAD SAFETY

CHILDREN AND ROAD ACCIDENTS

An analysis of the problems and some suggested solutions

Prepared by

BARRY ELLIOTT

Elliott and Shanahan Research

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Author:	ELLIOTT, Barry.
Performing Organisation:	ELLIOTT & SHANAHAN RESEARCH, 8 BERRY STREET, NORTH SYDNEY, N.S.W., 2060, AUSTRALIA.
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Abstract:

Road crashes involving children are examined in detail for the three most populous Australian states for the years 1981 and 1982. Individual crash records are analysed in depth, as well as mass data systems. The report includes a detailed literature review to determine what is known about the child road accident environment and the world of the child. Parent's and teacher's concerns are examined along with road safety education. The report concludes with a detailed analysis of suggested countermeasures and some suggestions for further research. In essence, the solutions to the problems require countermeasures which look beyond the child, being primarily aimed at other road users.

Keywords: Children, Teenagers, Accidents, In-depth Analysis, Mothers, Teachers, Education, Countermeasures, Research, Pedestrians, Pedal Cyclists, Vehicle Occupant Restraints, Young Drivers, Residential Streets, Speed, Graduated Licensing, Passengers, 'Bike-Ed', Helmet Usage.

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An Analysis of the Problems and Some Suggested Solutions.

prepared by
BARRY ELLIOTT B.Comm(Appl.Psych.)Hons.Dip.Ed.M.A.Ps.S

ELLIOTT & SHANAHAN RESEARCH
Research & Communication Psychologists

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EXECUTIVE SUMMARY

The report is divided into three major sections involving:

- (A) A situation analysis;
- (B) A discussion of the child, the parent, the teacher and education; and
- (C) Suggestions for possible future activities.

A. The Child Road Accident Situation

Road Crashes in Australia are the single largest cause of child deaths for children aged one year to sixteen years inclusive. The Federal Office of Road Safety recognised the need to identify high risk accident situations so as to identify specific target behaviours which could be modified and the risk of accidents or serious injury lowered. The outcome of the analysis was to be the preparation of guidelines for publicity campaigns.

Over 400 children are killed on Australian roads each year and at least 4,000 seriously injured. The incidence of road accidents involving children is likely to be considerably understated, especially with respect to crashes involving child pedal cyclists. In terms of international comparisons (a difficult assignment to carry out accurately), Australia has one of the worst child road accident records.

The significance of road crashes in child (0-16) deaths cannot be over-emphasised. However, the importance of road crashes as the main cause of death is considerably greater for youth (17-25), where Australia again performs badly in International comparisons.

Within Australia, there are significant differences between the states with respect to child road accident rates. Further analysis also reveals that considerable variation exists between states in terms of each child age group and road user type.

Analysis of Accident Statistics supplied by the three most populous states reveals that each of the various sub-age groups poses an entirely different set of behaviour patterns and each contributes quite differently to the total accident statistics in terms of road user categories:

- child vehicle passengers account for the greatest number of deaths and reported road injuries (over 45%);

- child pedestrian accidents account for approximately one sixth of all reported child road accidents;

- child pedal cyclists account for approximately one sixth of all reported child road accidents;

- almost 10% of child road deaths and road injuries involve children as drivers of cars or riders/pillion passengers on motor cycles;

- there is considerable variation by state in the accident pattern. N.S.W., in particular, has a high accident rate for the two largest categories of child road user accidents; viz., vehicle passengers and pedestrians;

- across all child road user categories combined, in the three most populous states, the greatest number of accidents involve teenagers (13-16 years of age), and especially males;

- more children 0-4 are involved in road accidents than children aged 5-7 and males outnumber females.

Vehicle Passengers

* Males and females are almost equally involved.

* The least involved are the 5-7 age group.

* The largest incidence of passenger accidents involve the 13-16 age group. They represent 23% of the population of children, and around 40% of the passenger accidents or passenger deaths.

Pedestrians

* The pedestrian problem is skewed towards males, especially in child pedestrian deaths.

* The 8-12 age group is considerably over-represented in accidents, but the problem is sizeable in all age groups.

* The least likely group to be involved in pedestrian accidents are females aged 0-7 years of age.

Pedal Cyclists

* Over 80% of child accidents or deaths involve a male pedal cyclist.

* The largest number of accidents (over 40%) involve teenage (13-16 years) males who represent only 12% of the child population. Males aged 3-12 years account for 33% of the accidents and 16% of the population.

Metro vs Non-Metro

* The child pedestrian problem is restricted primarily to metropolitan areas.

* Child vehicle passenger accidents account for proportionately more of non-metro accidents.

* Pedal cycle accidents are more predominant in the metropolitan areas, but are still significant in non-metro areas.

* Analysis of metro versus non metro areas varies dramatically between each of the three most populous states, suggesting that resources aimed at the child road accident problem could require entirely different allocations in each state.

Analysis of the literature relating to the child road accident environment suggests that child pedestrians and pedal cyclists are more at risk after school and early evening. Child pedal cycle accidents also occur at weekends according to hospital accident records. Residential streets are the key to child pedestrian and pedal cycle accidents.

Driver factors are believed to play a significant role in road crashes involving children as occupants, as pedestrians, or as pedal cyclists. Driver factors are related to speeds and residential streets. At speeds of 60 km/hr or greater drivers are unlikely to stop or be prepared to stop. Child pedestrians appear more likely to take cautionary action than drivers.

Young and/or novice drivers are disproportionately involved in road crashes involving children as pedestrians, but more especially with occupant casualties. In respect to the latter, a reduction in teenage/youth driver accidents would have a sizeable effect on teenage occupant deaths and injuries.

In addition to the macro analysis of accident data and the extensive literature review, 342 child accident records were studied in-depth in an effort to establish the accident precipitating factors. Most of the records involved a child fatality since fatalities provide considerably more recorded information. Scenarios were established for each age group/road user category. As age increases the number of scenarios needed also increases (see Summary section 4.26).

The fourth strand of information involved the interrogation of mass data systems. For Australia, as a whole, the Department of Transport Fatal File 1981 was used. Additionally N.S.W. and Victoria mass data systems were extensively interrogated. The results are summarised in Figure E (see sections 4.36).

B. <u>The Child, The Parent, The Teacher and Educator.</u>

Children are not little adults. Children are different. Extensive reviews exist documenting these differences. The current review attempts to synthesise what is known about children as road users.

Young children, in particular, display <u>poor</u>:

- powers of perception, concentration, attention, memory, and physical and emotional control.

- knowledge and understanding of traffic.

- behaviour patterns in traffic environment.

Children, in general, do not readily transfer theoretical education and knowledge to practical situations.

A small-scale exploratory study was carried out in Sydney amongst mothers and schoolteachers. Mothers and teachers see their roles quite differently with respect to road safety education. They agree, however, on the need to provide more and better road safety education and appear amenable to many of the suggestions in section 8.

Road safety education is examined, but not in minute detail. The aim is to examine issues rather than programs. The issue of what are appropriate goals is considered. Whilst the recommendation is that education is correctly aimed at providing knowledge, <u>more emphasis is needed on behavioural training rather than on the normal educational paradigm.</u> The aim would be to train 'safe' road behaviours.

Whatever the outcome, education or behavioural training, <u>accident reduction is not the primary goal of most educational efforts and should not be the sole or major criteria for evaluation.</u>

Examination of instructional variables suggest that much more attention needs to be devoted to <u>implementation issues</u> than has occurred in the past with respect to road safety educational materials.

Fantasy characters appear not to have been employed in Australia since Hector The Cat was demonstrated not to have been effective. <u>This wholesale rejection of all fantasy characters is questioned.</u>

Children's Traffic Safety Clubs are critically examined. If pre-school children are to be trained then parents/teachers must be involved in real world modelling. They must be given instruction and preferably not all in one block. The essence is training, based on behavioural modeling, involving the parents, and not on education as normally considered.

The question is raised as to whether it may not be better to train young children not to enter the road without an adult, as per the Embry Safe Playing Program.

C. A Variety of Possible Future Activities

Figure F (section 8.1) summarises the main countermeasures proposed. In examining the countermeasures it is urged that the aims of many of the countermeasures are 'safe' road behaviours. It is argued that safety is 'behaviour' and the appropriate goal of instruction is the adoption of 'safe' road behaviours. In the context of child road safety, the question is not how to reduce the accident problem, but to replace 'unsafe' behaviours with known 'safe' behaviours.

Again, implementation is stressed since all too often the best devised programs are not given a proper chance, because too little attention is devoted to implementing the program.

The countermeasures recommended are related to each of the road user categories. Many of the countermeasures have a direct impact on someone other than the child (see list in 8.6). The solutions to the child road accident situation are based on two premises. First, a wide range of measures is needed to impact on the current situation since it is, in reality, a series of entirely different situations. Second, the child, in many instances, is the victim of the situation and the solution is in the hands of the adult, not the child.

Most of the countermeasures proposed relate to existing practices. Some are new. Some involve publicity. Most involve a range of factors including, publicity and enforcement.

Vehicle passenger accidents account for the greatest number of child road casualties. The single most effective means of protection is a child restraint or seatbelt. Wearing rates are still quite low. Even in Victoria, which has made considerable progress in wearing rates, teenage wearing rates in the rear seat are still in need of improvement. It is suggested that drivers ought to be liable for occupants up to age 18, and that what is needed is publicity and enforcement on a continual basis over a number of years.

Pedestrian Accidents are the second largest contributor to child road casualties. However, when looked at in perspective to all pedestrian casualties, adults are far more significant. A number of countermeasures are proposed:

- a mass media publicity campaign aimed at adults about child pedestrian safety.
- changing the status of residential streets so that all roads (designated) in residential streets are given the same legal status as exists for pedestrian crossing.
- lowering vehicle speeds in residential streets.
- behavioural training for pre-schoolers, involving parents and pre-school teachers.

Pedal Cycle Accidents are clearly much more significant than road accident statistics reveal. The suggested countermeasure involves a much greater application of 'Bike-Ed' and suggestions are made as to how to bring this about. Child safety helmets are considered and the recommendation is that mass media publicity be aimed at the parent and teacher, not the child.

Whilst a number of other countermeasures are recommended, young drivers are considered in detail because of their importance to (a) child road accidents, and (b) the total road accident statistics. Graduated licensing is recommended with respect to the provisions relating to supervision, and the suggested lack of presence of child and teenage passengers.

The analysis is completed by some suggestion with respect to areas in need of additional research. This final chapter is not exhaustive. The suggestions reflect the information needs in this area as seen by the research and communication psychologist who has carried out this analysis and those in the Federal Office of Road Safety who read the draft manuscript. The purpose in making these suggestions is the hope that somebody, somewhere, sometime will investigate further.

A. THE CHILD ROAD ACCIDENT SITUATION

1.0 INTRODUCTION

1.1 Background
1.2 The Continuing Nature of the Problem
1.3 The Incidence of Road Crashes Involving Children in Australia
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1.8 The Problem of Age Differentiation
1.9 Age Categorisations Used in the Current Study

This introductory chapter attempts to put road crashes involving accidents to children into perspective in terms of their relative importance when compared to other age groups, to other causes of death or injury. Australian child road deaths and road injury statistics are compared with available equivalent Western overseas countries. The issues of unreported accidents and the methodological problem of reporting accidents are raised. Finally, the ages used to define "child" as 0,17, i.e., 0 to 16 years inclusive, are delineated including sub-groupings.

1.1 Background

The Federal Office of Road Safety (FORS), within the Department of Transport (DOT), commissioned B.J. Elliott & Associates to undertake "background research" which was required by the Office for the development of appropriate road safety education material as part of the intended 1984-1986 National Road Safety Public Education Program. This Program would be aimed at improving the road safety of children.

The original "Specification", (July 1983), included, in full, as Appendix A, stated that:

> "The aim of this program is to examine these crashes to identify specific factors which could lead to improved safety, and be effectively conveyed by a publicity campaign."

The envisaged final outcome, as per the "Specification", was to be a National road safety public education program aimed at reducing the incidence of children aged 0-16 inclusive involved in road crashes.

B.J. Elliott & Associates (now Elliott & Shanahan Research) were commissioned on the 22nd of December 1983 to undertake the following, as per the original "Specification":

> "Research Required
>
> "Initial research is required to define the general nature of road crashes involving children.
>
> "Factors which should be considered include:
>
> 1. The frequency and type of accidents involving children;
> 2. Accident type and level of severity;
> 3. Site characteristics with a high accident frequency or severity;
> 4. Risk exposure of various groups.
>
> "Having identified high risk accident situations consideration should then be given to identifying specific target behaviours which could be modified to lower the risk of accident or serious injury.

"The next stage of the project would be to identify the knowledge, behaviour and attitudes to relevant groups in relation to individual target behaviours and, if relevant, the psychological and physiological limitations of children in these situations.

"Research should also identify what is the appropriate role for parents, teachers and others in educating children in road safety matters.

"The objective of this research is to develop to "concept" stage, a brief which could be handed to an advertising agency which identifies specific target behaviours, target groups and effective communication strategies." (DOT., July 83, pp.2-3).

1.2 The Continuing Nature of the Problem.

There is something 'special' about childhood. A child is not a little adult. When children are involved in road accidents the level of emotional trauma to all involved appears likely to be considerably greater than where an older person is involved. Children have a lifetime ahead of them. Adults are likely to react more emotionally toward children than to other adults. Whatever the reason, children are somewhat 'special'.

Road crashes can involve considerable human suffering and economic cost to both the vehicle driver/owner and family, and to the broader community. Road crashes involving children may or may not create substantial personal and community costs but the emotional anguish to 'significant others' is recognised as considerable, let alone the personal suffering to the child and the trauma that it creates for loved ones.

The recent Organisation for Economic Co-operation and Development (OECD) (1983) report Traffic Safety of Children concluded that:

> "Apart from the economic problem due to the loss of life amongst those who have not yet become productive members of the community, the premature death of these young road users is perceived throughout society as posing grave human and moral problems." (OECD 1983, p.25).

The Swedish pioneer expert in field, Stina Sandels, consistently argued that, below the age of approximately 10 years, children do not have the sensory or cognitive ability to cope with modern traffic. Accordingly, remedial measures must be primarily aimed at segregating children and traffic.

The implication of Sandels' conclusions is that children and traffic ought to be separated. However, this can only be achieved by substantial social disruption and massive economic costs.

Whilst Sandels may be correct, it is equally true that many children below the age of 10 do cope successfully with traffic. Rather than accept Sandels' analysis, there is a need, as suggested by Howarth, Routledge, and Repetto-Wright (1974):

> "to know more precisely and quantitatively just how big are the risks which children run in different situations, why some children are less at risk than others, what are the limits to what can be achieved by training, and what are the most effective ways to segregate children and traffic". (Howarth, et. al., 1974, p.320).

Van der Molen (1981) argues that whilst Sandels' conclusions have dominated the traffic world for some time, real world observations of children coping with traffic and empirical research do not justify such a conclusion.

In theory, the chain of causal links leading to a child accident can be broken at any point. Pearn and Nixon (1981) point out that the links in the childhood trauma chain include such predisposing factors as the nature of the environment, the socioeconomic status, the standard of housing, societal attitudes to child safety legislation in the local authority, and a miscellany of other factors, including the proportion of the public purse spent on road engineering.

The chain of causal links can be broken at any point. The key lies in finding those links which can affect the largest number of child accident situations. Jarvis (1983) is of the opinion that, as far as pedestrian and bicycle accidents are concerned, the major cause is the unpredictable behaviour of the child in an otherwise basically stable road environment.

> "If this individual behaviour is difficult to alter by direct action, then attention must be given to other contributing causes which most directly affect the level and consequences of the triggering mechanism". (Jarvis 1983, p.36).

Children are often quite predictable, but they can, and do, exhibit unpredictable road behaviours. It is important to understand under what circumstances predictable behaviour breaks down and results in "unsafe" road behaviours. Such unpredictable behaviours may also be related to children's capacity (abilities) to cope with traffic. Since such gurus like Sandels (1975) have such grave doubts about the abilities of young children under 8, and perhaps under 12, to participate independently in traffic, some researchers (e.g. Jarvis, 1983) have suggested that the real challenge is to educate both parents and drivers about their responsibilities to children in traffic, especially with regard to pedestrians. Child cycling accidents involve largely older children and they should be amenable to educational programs.

1.3 The Incidence of Road Crashes Involving Children in Australia.

In theory, it may be possible to conceive of a society whereby child deaths can be reduced to a very low level. However, in practice, it seems unlikely that they can be totally eliminated. What is a realistic, tolerable, level to which road traffic authorities should aim? Road Safety Campaigns vary in their effectiveness. Child campaigns tend to be particularly ineffective because the age of the child makes him or her difficult to influence. Pearn suggests, that as a realistic short-term goal for those responsible for children's welfare and safety;

> "No State should accept a child run-down accident rate greater than 3.0 per 100,000 (children 0-15). Similarly, no State should accept a child death-rate (from inter-vehicle crashes) greater than 3.0 per 100,000...." (Pearn, 1978, p.77).

The following three tables reveal that, as yet, some states have not been able to achieve this goal.

TABLE 1 CHILD ROAD FATALITIES - 1981
(Numbers)

	Total	NSW	Vic	Qld	SA	WA	Tas	ACT	NT
0-4	93	37	28	11	2	5	3	1	6
5-7	73	26	15	20	5	1	3	-	3*
8-12	99	34	31	11	10*	5	4*	-	4*
13-16	151	52	29	33	18*	8	5*	2	4*
0-16#	416	149	103	75	35	19	15	3	17
Pass.Car	177	66	38	32	13*	11	5*	2	10*
Ped'rian	136	55	38	18	8*	3	8*	1	5*
Pedal Cyclist	62	14	22	14	7	4	-	-	1
Motor bike/ pillion	25	12	2	7	2*	-	1	-	1*
Car Drivers	16	2*	3	4	5*	1	1	-	-
Total	416	149	103	75	35	19	15	3	17

Source: Information supplied by each State on request.

* Some estimation required because age classification in data supplied not identical to those used in this table.

i.e. 0<17

TABLE 2

CHILD ROAD FATALITIES - 1981

	Population 0-16# at Risk '000	Deaths: Pedestrian No.	Deaths: Pedestrian Rate*	Deaths: Passengers No.	Deaths: Passengers Rate*
N.S.W.	1440	55	3.8	66	4.6
VIC.	1113	38	3.4	38	3.4
Q'LD.	691	18	2.6	32	4.6
S.A.	357	8+	2.2	13+	3.6
W.A.	384	3	0.8	11	2.9
TAS.	126	8+	6.3	5+	4.0
A.C.T.	74	1	1.4	2	2.7
N.T.	44	5+	11.3	10+	22.7
AUSTRALIA	4229	136	3.2	177	4.2

Source: Statistics supplied by each State on request.

* Number of deaths per 100,000 children 0-16.

\+ Estimates due to states collecting data in different age categories in top age category.

i.e. 0<17

TABLE 3

CHILD ROAD FATALITIES - 1982

	Population 0-16# at Risk '000	Pedestrian No.	Pedestrian Rate*	Passengers No.	Passengers Rate*
N.S.W.	1444	51	3.5	77	5.3
VIC.	1108	28	2.5	36	3.2
Q'LD.	707	18	2.5	41	5.8
S.A.	354	8+	2.3	13+	3.7
W.A.	390	11	2.8	27	6.9
TAS.	125	4+	3.2	6+	4.8
ACT.	74	1	1.4	-	-
N.T.	45	5+	11.1	10+	22.2
AUSTRALIA	4247	126	3.0	210	5.0

Source: Statistics supplied by each State on request
* Number of deaths per 100,000 children 0-16.
+ Estimates due to states collecting data in different age categories in top age category.
# i.e. 0<17

As a proportion of all road fatalities, or all road injuries, children 0-16 represent only a small, but significant, proportion when compared to the total, as can be seen in table 4 below.

In interpreting road crash data, it is important to recognise that the data may not tell the whole story. Certainly, as far as fatals are concerned, the data is likely to be a reasonably accurate representation of the state of affairs in 1980. However, for accident injuries, the figures could well be substantially understated.

TABLE 4 AUSTRALIA 1980

AGE	Population Incidence %	As a Percent of Fatals %	As a Percent of Road Injuries %
Children (0-16)	28.3	12.7	15.4
Youth (17-25)	17.1	36.6	40.1
Adults (26-59)	41.2	34.3	32.9
Adults 60 and over	13.4	16.4	7.9
TOTAL	100%	100%	96.3%

Source: RACS (1982) "Road Trauma" - derived from Tables p15-16.

1.4 The Problem of Unreported Accidents

There is evidence that many accidents go unreported. Further, some reported accidents do not find their way into the official road traffic accident statistics. Searles (1980), in a study carried out for the National Roads and Motorists' Association (NRMA) in N.S.W., compared a random sample of "comprehensive" insurance claims for crashes occurring within the County of Cumberland (Sydney) with the official statistics and found:

> "Twenty-percent of 1195 sample crashes involving the insured's vehicle being towed from the crash scene were reported to Police but did not appear in the official statistics....
>
> "Only 1.5% of unreported crashes involved personal injury. Nine-percent of crashes reported to the Police involved personal injury but did not appear in official statistics....
>
> ".... a large proportion (35%) of the sample casualty crashes were reported to the Police but did not appear in the official statistics." (Searles, 1980, p.64-66).

Thorson & Sande (1971) found that only 28 percent of persons seriously injured in Sweden were reported, as such, in the official road accident statistics and a further 20 per cent were recorded as slightly injured. They suggest that one half of the seriously injured did not appear at all in the official statistics.

Bull & Roberts (1973) compared police and hospital records in Birmingham city in England, where hospitals and doctors were under no obligation (at that time) to report accidents to the police (except in the case of death). They found a low level of notification for cycling injuries, especially when no motor vehicle was involved (2% only notified). Only 81% of all serious injuries and 65% of slight injuries were reported for all accidents.

The OECD (1983) Scientific Expert Group, in its report on "Traffic Safety of Children", addressed this problem and concluded (p.13) that only 25-50% of accident victims in hospitals had been reported to police. The Geelong Bike Plan (1978) in Victoria, Australia, also found that only 1 in 30 cycle accidents to secondary school children requiring medical attention were reported.

1.5 Methodological Problems in Reporting Accidents

One of the problems in conducting any analysis with accident data, is the variety of methods used by different institutions involved in collecting and reporting the data.

In Australia, the State Transport Departments forward statistical data to the Australian Bureau of Statistics (ABS) and there is some degree of consensus in some of the material gathered. Classification for a 'fatality' is standard - death within 30 days - but a difference lies in the reporting of casualty data. Much of the data lacks specific causal factors, which makes it difficult to identify the reason for the accident and to conduct any comparative analyses with existing data.

It is not easy to compare Australian data with overseas published statistics. Some studies use the number of accidents per 10,000 or 100,000 of population, percentage of population, percentage of miles travelled, or number of motor vehicles registered. Another problem is the recorded reason for the death or injury - was the cause the collision with the motor vehicle or the impact on the road; did the subject suffer some other accident, such as a heart attack, which caused the death; and was death a direct result of the accident or some medical complication? The question of how many days after the accident should a death be attributed to the traffic accident is also a source of variation between countries.

One further issue is the classification of 'slight' and 'serious' injuries. Usually, injuries requiring hospitalisation are classified as serious, but the problem is compounded when what was initially considered a slight injury becomes a serious injury after a period, and vice versa.

Some of these problems can be overcome by standardising the accident reporting forms, by training medical personnel in their correct use, by the wider use of computers in hospitals, which will allow greater access and analysis of accident data. But even more importantly, in Australia, is the need to centralise road accident records so that uniformity can be achieved and a much greater access to records in order that careful analysis is encouraged rather than inhibited as is currently the situation. In the process, there is a vital need to collect and centralise data relating to the cause of the accident.

The critical nature of the lack of standardisation has been emphasised in the most recent Report of the House of Representatives Standing Committee on Road Safety (HORSCORS) in the very first conclusion:

> "1. The Committee believes that a set of standardised statistics should be devised and collected throughout Australia to provide a more substantial road safety data base for Australia...." (HORSCORS 1984, p.viii).

At the moment, precise data, even relating to fatals amongst children 0-16 inclusive, is not readily available. In this volume a variety of sources have been used in an effort to derive an accurate picture. No matter what sources are used, the figures vary. Accordingly, it is difficult to be accurate. Table 5 illustrates the problem. The data is just for fatalities where definition is much more clear-cut.

TABLE 5

CHILD FATALITY FIGURES - 1981
Children 0-16

	ABS*	DOT**	States***
0-4	94	91	93
5-7	73	69	73
8-12		91	98
13-16	246#	161	152
Total 0-16	413	412	416

Sources:

* ABS. 9405.0 Supplementary Tables 18.4.84.

** DOT. Fatal File 1981.

*** States statistics supplied on request by each State (in some instances age groups were not identical and extrapolation was required in the small states only).

ABS. data uses 8-16 age group.

1.6 Child Road Accidents in Perspective

1.61 Deaths

Whilst children are "special", youth (15-24) are a much greater problem, at least in terms of incidence of fatals and road injuries. The relative importance of road accidents involving children and young people can be seen when comparative figures for principal cause of death are examined in Table 6. For "all ages", only 3.4% die as a result of road accidents. For infants (0-4), the relative figure is 3.6%. For children (5-14), it is 30.1% and for youth (15-24) it is 50.5%; i.e. for every death amongst youth, one out of two occurs as a result of a road accident. For children the figure is almost one out of every three deaths.

When compared with youth (15-24), the figures in table 6 tend to hide the importance of road accidents involving children. This arises because of "all other causes" in the 0-4 age group. However, apart from children under one year, road accidents are the leading cause of death for all children 1-16 years of age.

TABLE 6

PRINCIPAL CAUSE OF DEATH - 1980

	Age Groups			
	0-4	5-14	15-24	All Ages
	%	%	%	%
Road Accidents	3.6	30.1	50.5	3.4
Other Accidents	6.9	20.2	13.0	2.6
All other causes	89.5	49.7	36.5	94.0
	100%	100%	100%	100%
Base Number	3,075	694	2,593	106,568

Source: RACS. (1982) "Road Trauma" - derived from table p.17.

O'Connor (1982) studied child deaths in Australia in an attempt to identify the principal causes of accident injury and death in Australian children (0-14) over a period of twenty years (1958-1978).

The following quotations have been extracted from O'Connor's "Summary and Synthesis" (underlining not in original).

> "...accidents are one of the leading causes of death in Australian children; indeed, beyond the age of one year they account for the majority of deaths. Furthermore, as a child health problem they are increasing in importance relative to other causes of death....
>
> "Transport accidents have been the leading cause of death in children for the years studied between 1921 and 1978, and furthermore it is the only cause which has shown an increasing death rate over time.....
>
> "The highest transport accident death rates were from "motor traffic accidents", especially involving collision with: pedestrians; other motor vehicles (resulting in death to child passengers); and with cyclists.
>
> "Death rates from 'motor vehicle traffic accidents' have increased over time in children aged 5 years and over, especially in 10-14 year old females where the rate has increased by 60% in the last 20 years....
>
> "Analysis of causes of deaths in each State shows a very similar pattern to the causes of death in Australia as a whole.... In the Northern Territory the death rate from transport accidents and drownings are over twice as high as any other state...." (O'Connor 1982, pp. 1105-107).

Table 7 reveals that the death rates from motor vehicle traffic accidents increased between 1956/58 and 1976/78 but these increases did not occur equally across each of the three age groups. The 5-9 year olds increased substantially, but not as much as the 10-14 year olds where the rate went up by 35%; and, whereas in 1956/58 it was 22%, less than the 0-4 year olds, it exceeded the 0-4 year old rate in 1976/78.

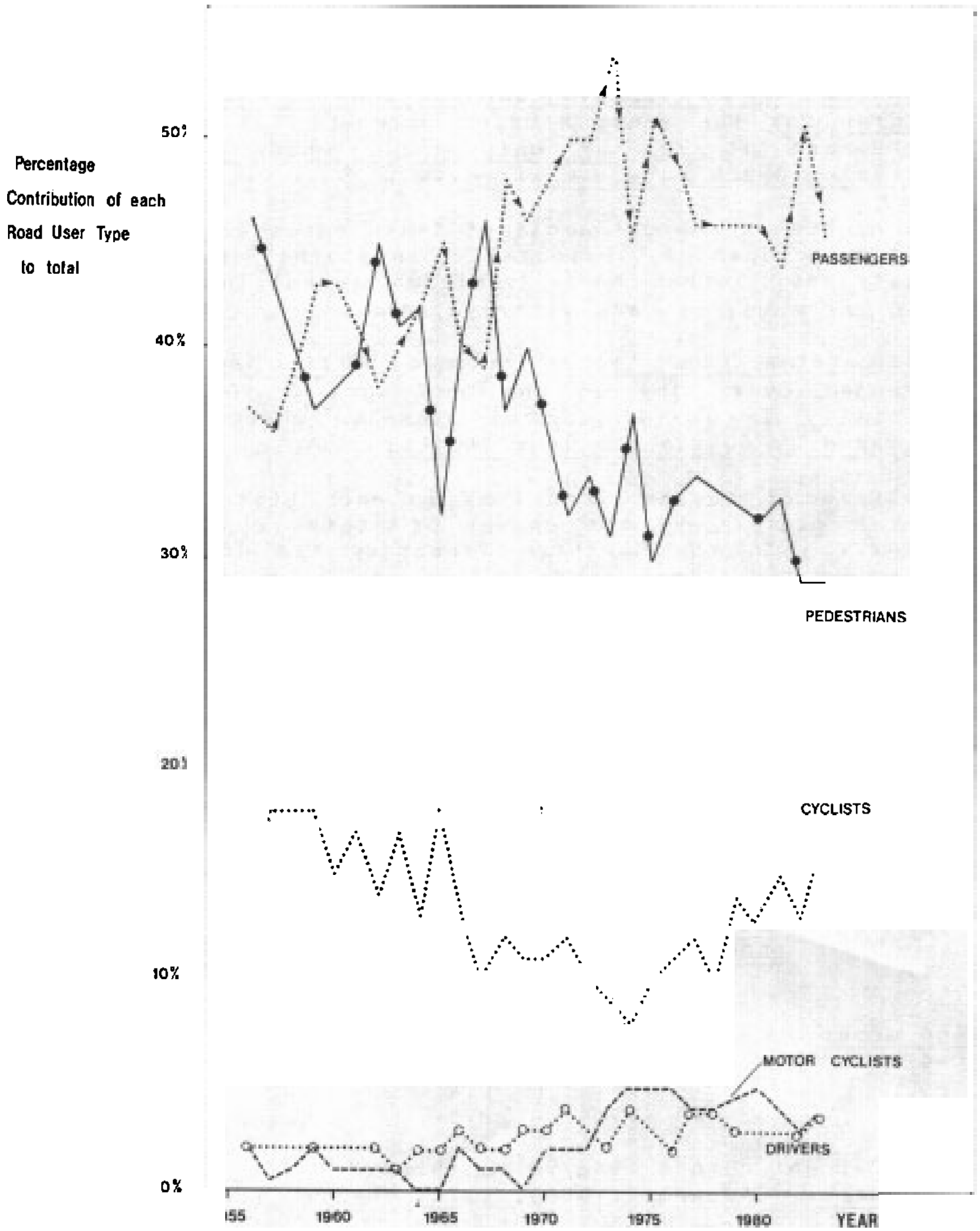
TABLE 7

AGE SPECIFIC DEATH RATES (/100,000)
FROM MOTOR VEHICLES TRAFFIC ACCIDENTS

Age Group	1956/58	1966/68	1976/78	% change*
0-4	8.5	9.8	9.0	+ 5
5-9	7.9	8.8	9.2	+16
10-14	6.7	8.3	9.1	+35

* Percent change 1956/58 to 1976/78
Source: O'Connor (1982), p.15, derived from table 1.20.

FIGURE A: CHILD (0>17) ROAD DEATHS 1956-1983
Contribution of each ROAD USER Category
to TOTAL CHILD ROAD FATALITIES



Sources: (1) A.B.S. Cat. 14.9 (1956-72), Cat. 9403.0 (1973-78), Cat. 9405.0 1980+

(2) D.O.T. F.O.R.S. 1978-79

Table 8 reveals that the increases in death rates have been due primarily to females in the 0-4 and 10-14 age groups, but males are still the major problem, even though females have become more significant.

TABLE 8

AGE AND SEX SPECIFIC DEATH RATES (/100,000) FROM MOTOR VEHICLE TRAFFIC ACCIDENTS.

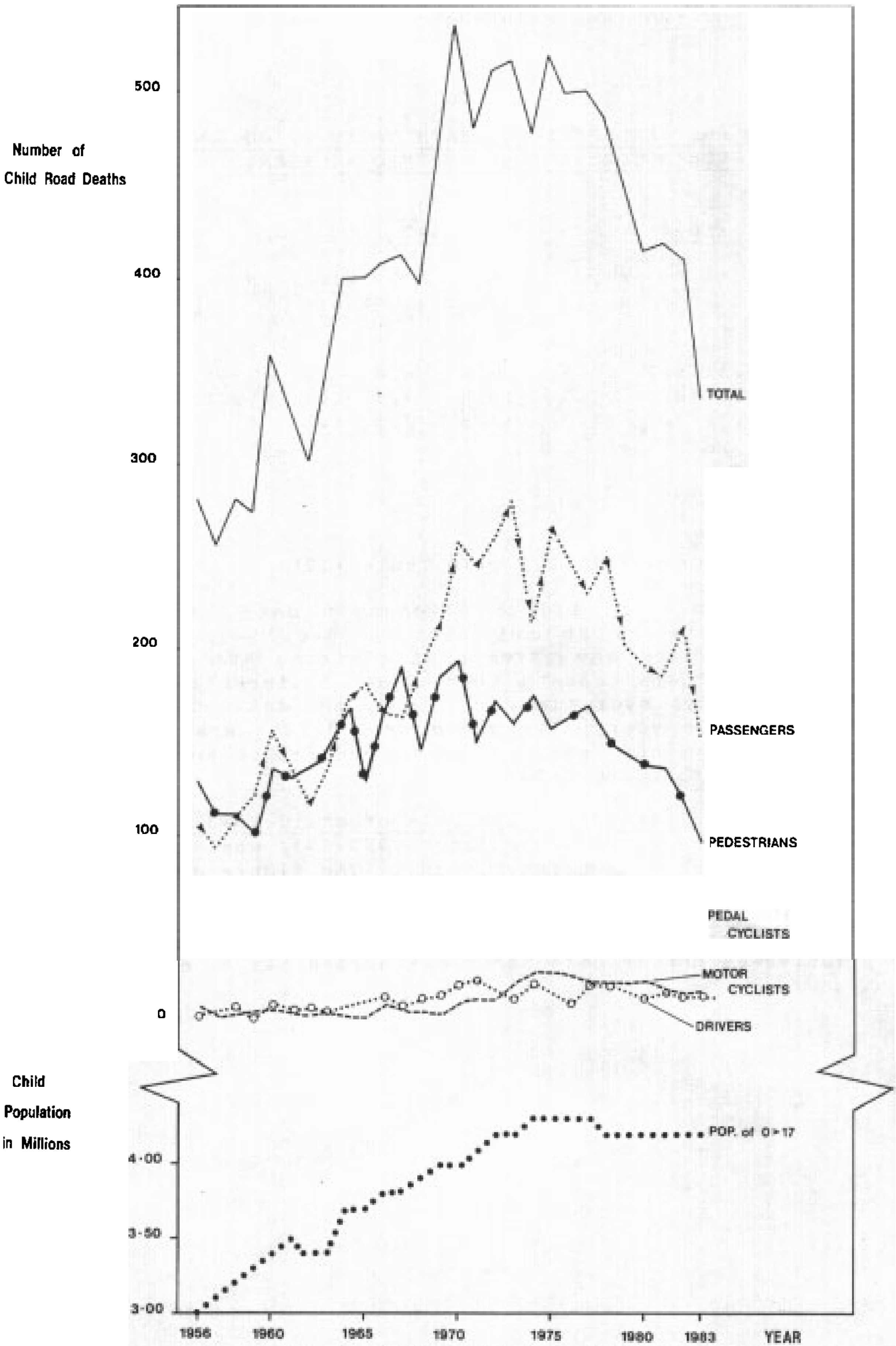
	Age Group 0-4			5-9			10-14		
Year	M	F	M:F Ratio	M	F	M:F Ratio	M	F	M:F Ratio
1956/58	10.3	6.7	1.5	9.8	6.0	1.6	9.5	4.0	2.4
1966/68	11.0	8.5	1.3	10.0	7.5	1.3	12.1	4.9	2.5
1976/78	10.3	7.7	1.3	11.3	7.0	1.6	11.0	7.0	1.6
% change 56/58 to 76/78	0	+13		+15	+17		+16	+16	

Source: O'Connor (1982) p.16 Table 1.21

It was not possible to update O'Connor's data because the published ABS statistics do not use the 0-4, 5-9, 10-14 age groupings. Furthermore any attempt at plotting ABS Fatal data over time by age groups faces a lack of age differentiation, and a lack of uniformity, over time. In 1956, the data provided for Australia is under 5 years, 5-6 years, and 7-16 years. In 1978 and 1979 there is no ABS data. In 1980, and following, the data is supplied as under 5, and 5-16 years.

Figure A provides an historical analysis of child road fatalities 1956 - 1983. Two of the 28 years data (1978-79), was supplied by the Federal Office of Road Safety (FORS). The figure depicts the contribution of each of the road user types to the total of all child road fatalities using ABS data, for Australia as a whole. The data is relative, not absolute. Thus, as one road user category increases one or more other categories has to decline.

FIGURE B: NUMBERS of CHILD ROAD DEATHS 1956 – 1983
by ROAD USER TYPES, and
POPULATION 0 ➤ 17



Sources: (1) A.B.S. Cat. 14.9 (1956-72), Cat. 9403.0 (1973-78), Cat. 9405.0 1980+

The most notable change over the last 28 years has been the dramatic relative increase in vehicle passenger deaths (from 37% to around 50%) and the dramatic decline in the relative incidence of pedestrian killed (from 46% to 29%). Apart from these substantial changes, these two road use categories still account for approximately the same combined relative percent of child road deaths (i.e. around 80%).

Pedal cycle deaths represented 14% of the fatalities in 1956 and steadily declined, relatively, until 1974. Since then, their relative contribution has steadily grown again (1983 - 17%).

Motor cyclists and drivers represent a small, but slowly growing proportion, of child road deaths. Motor cyclists accounted for less than 1% in 1957, but have been as high as 5% between 1974-1976 and 1980. Drivers accounted for 2% until 1965, but represented 14% in 1980.

Figure B, represents the absolute number of children killed in road crashes between 1956 and 1983 along with the population of children under 17 for these years.

The population of children, under 17, peaked in 1974-77 and moved back to a lower plateau in 1978-1983, around 1972-73 levels. The total number of child road deaths moved from around 260 in 1956 to a peak of 536 in 1970, well ahead of the population peak in 1974. The incidence of fatals declined substantially from 1977, at the same time as the population declined.

In absolute numbers, vehicle passenger and pedestrian deaths are on the decline. Pedestrian deaths, in 1983, were lower than for any other year over the 28 years, including the low of 1959. Vehicle passenger deaths, whilst declining, are still above 1963 levels and around the average of pedestrian deaths over the 28 years.

Pedal cycle deaths peaked in 1965, but the downward trend seems to have reversed in recent years.

Over the period, child road deaths for child drivers and motor cyclists (mostly all illegal) have grown substantially in number and have similar patterns (but this could be a function of small numbers). In 1956, there were 2 child drivers killed and 6 child motor cyclists. In 1983, it was 12 drivers and 14 motor cyclists. The peak for drivers was 1971 (20), and for motor cyclists 1974/75 (23 in each year).

Injury data over this period cannot be compared because of definitional changes. However, the small number of child drivers and motor cyclists killed should be seen also in the light of the fact that around 200 children in each of the last four years have been admitted to hospital for accidents involving motor cycles, and around another 100 per annum as car drivers.

1.62 Injuries

Analysis of road traffic injury data, as distinct from fatalities, reveals the extent of the problem of children and road accidents. In 1978, death rates due to road traffic were of the order of 10; i.e. 10 deaths per 100,000 children 0-14, but, as Table 9 reveals, accident rates were at least twenty times higher, and in one state, almost 40 times higher.

Childhood road traffic accident rates were higher amongst males and vary considerably between states with N.S.W., N.T. and S.A. having the highest rates in 1978.

TABLE 9

ROAD TRAFFIC ACCIDENT INJURY RATES/100,000
1978

State	0-4	5-9	10-14	Male	Female
N.S.W.	294	418	430	429	333
S.A.	222	349	475	407	314
N.T.	235	268	282	281	237
W.A.	190	253	326	287	221
Vic.	157	259	299	284	196
Q'ld.	163	225	277	261	183
Tas.	158	249	240	260	174
A.C.T.	115	193	320	249	156

Source: O'Connor (1982), p.98-99 derived from tables 3.34 and 3.35. ABS supplied data.

An attempt was made to provide an historical look, since 1956 to date, in terms of age and road user type for all road accidents involving injuries. However the published ABS data does not allow meaningful trends to be established even on a National basis. First, the age groupings change. Second, there is no data for 1978 and 1979. Third, and most importantly, the definition of 'injured' or 'seriously injured' changes so dramatically that the data from 1980 onwards bears no resemblance to that available before 1980.

1.7 Some International Comparisons

Comparisons of road accident statistics are fraught with difficulties for some of the reasons posed in 1.4 above. In order to put some perspective on child road accidents in Australia, table 10 attempts to relate Australian child road deaths with a composite statistical equivalent for nine contributing OECD countries (Germany, Finland, France, Netherlands, Norway, Sweden, Switzerland, United Kingdom, United States). The figures are meant to be indicative, and not definitive. The fatality figures for the differing countries use various definitions of death within 24 hours, 3 days, 6 day or 3 months, whilst for Australia, it is within 30 days.

The figures in table 10 act as a salutary reminder to all concerned with road safety in Australia. First, it suggests that almost one in every three deaths amongst 5-14 year olds will occur as a result of a road accident. Second, it suggests that Australia's record in road accident fatalities involving children is amongst the worst in international comparisons. In both age splits, Australia is not only above the mean of the nine countries, it is near or above the highest levels in the range. Admittedly, a number of alternative explanations can be postulated for the differences in table 10. Any such explanations must be purely speculative.

Table 10 also reveals that Australia has a much higher percentage of "youth" dying in road accidents than the average or the extreme of the range. Furthermore, as a percentage of all road deaths for all ages to all deaths Australia is above the OECD mean and range.

The OECD Report concluded:

> "Road accidents may, thus, be seen to constitute a real scourge in the case of children and this problem requires to be investigated in greater depth so as to combat it more effectively." OECD (1983), p. 16.

TABLE 10

PERCENTAGE OF ROAD ACCIDENT DEATHS TO ALL DEATHS

Age Group	Australia* 1980	Mean OECD** 1979	Range OECD 1979
0-4	3.6	2.2	0.9 - 2.5
5-14	30.1	25.5	17.9 - 33.3
0-14	8.5	6.7	4.7 - 9.5
15-24	50.5	39.7	22.5 - 46.0
All ages	3.4	2.1	1.0 - 2.6

Sources: * RACS. (1982) "Road Trauma" (p.7).
** OECD (1983) "Traffic Safety of Children" (p 16)

The relative magnitude of the Australian problem, vis-a-vis other countries, is not confined to child road deaths or accidents. Jarvis (1978) ranked 21 countries for pedestrian (all ages) death rates/10,000 registered vehicles for 1974. The United States of America had the lowest rate at .064, whilst Poland had the highest rate at 1.78. Australia had a rate of .13 which is roughly double that of the U.S.A. Admittedly, in 1974, Australia was in the top five countries for the lowest rates. However, back in 1966 and 1970 Australia was ranked third lowest behind Sweden and the U.S.A.

The Geelong Bike Plan (1978) suggested that Australia's total cycle accident rate was five times that of the U.S.A. and that it had increased, and was going to increase, due to the increase in interest in cycling, resulting in higher cycle sales.

The above comparisons should not be taken as solid evidence of Australia's relative position. They do suggest that Australia, in all probability, has a relatively high proportion of child deaths due to road accidents.

1.8 The Problem of Age Differentiation

Thus far, it has been established that road accidents involving children are a sizeable proportion of accidents and second only to the problem of youth. One of the problems of definition and making comparisons is the variations in differentiation of children, or youth, etc., by age.

Generally, children are defined as 0-14 and this applies in Australia and the OECD reporting nations. Youth are, therefore, defined as 15-24 years of age. The OECD splits children into three age groups 0-4, 5-9, 10-14. The Australian Bureau of Statistics (ABS) differentiates two groups only, 0-4 and 5-14 inclusive, although the 5-9 age split is collected but frequently not published.

Within the relevant Australian State Road Safety bodies, and the various state offices of the ABS, there is a variety of ages used in data collection: e.g.

- Queensland ABS Cat. No. 9404.3/9403.3 under 5, 5-6, 7-16.

- Victoria ABS Cat. No. 9402.2 under 7, 7-16. Road Traffic Authority "Road Accident Facts" July 1983 Under 5, 5-16.

- NSW Traffic Authority - "Annual Report" 1982-83 Table 2 Appendix 7. 0-2, 3-7, 8-12, 13-16. "Road Traffic Crashes in N.S.W. Statistical Statement" Year Ended December 31st, 1982. 0-4, 5-7, 8-9, 10-14, 15-19. "Supplement to 1982 Statistical Statement" 0-4, 5-7, 8-16.

1.9 Age Categorisations Used in the Current Study.

In carrying out the analyses reported later in this volume four age differentiations are consistently employed whenever the data can be obtained to fit the age classification: children 0-16 (0<17)

0-4 years - pre-school
5-7 years - infants/lower primary
8-12 years - upper primary
13-16 years - high school
0-16 years - pre-driver's licence.

The original "Specification" (FORS 1983) defined children 0-16. Since 17 year olds are able to be licensed drivers the cut off at 16 has an intuitive appeal. Additionally, the incorporation of sixteen year olds with 15 year olds seems logical since 17 year olds are treated as adults in terms of being able to be licensed drivers. This applies across most Australian States and Territories. In some states, 16 year olds can obtain some form of driver's licence.

The differentiation of 0-16 into four age groups has been instituted so as to roughly coincide with the educational institutional framework, recognising of course that they too differ slightly across the respective states.

2.0 ANALYSIS OF CHILD ROAD ACCIDENT STATISTICS

This section of the report attempts to extend further the analysis commenced in the previous section. It begins with a brief look at the contribution of key road user types to child road deaths and injuries in OECD member countries. National road casualty data is provided along with a brief analysis by state. The emphasis, in this section of the report, is on a detailed analysis of the three most populous states: in terms of age, sex, road user type, and metropolitan versus urban. Detailed statistics for each of the three main child road user categories are included: An overview is also provided in an attempt to summarise the road casualty statistics. The section concludes by briefly examining data on risk and exposure, and the nature of injuries.

2.1 Overseas Experience

In order to place some perspective on the subsequent detailed analysis of Australian data, other Western nations can provide a starting point and act as a frame of reference. Sixteen OECD member countries (Belgium, Canada, Denmark, Finland, France, West Germany, Ireland, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and United States) provided data for 1979 as reported in, the OECD 1983 report on "Traffic Safety of Children". The results suggest the following conclusions:

Of all child road deaths which occurred in 1979, across the 16 OECD countries:

pedestrians accounted for 44%
users of motorised two wheelers 4%
cyclists accounted for 17%
occupants accounted for 35%

Table 11 reveals that the 0-4 age group is the least affected in child road deaths accounting for 28% of all road deaths amongst 0-14 year olds.

TABLE 11

CHILD ROAD ACCIDENTS ACROSS 16 OECD MEMBER COUNTRIES - 1979

Age	Child Road Deaths 0-14 Mean %	Child Road Injuries 0-14 Mean %
0-4	28	23
5-9	37	37
10-14	34	40
	100%	100%

Source: OECD (1983), p 16, tables 11.2 and 11.3.

Child (0-14) road deaths represent, on average, 8.4% of all road deaths (range 7.% - 13.6%). This figure varies substantially according to road user type:

- child pedestrians - 18.4% of all pedestrian fatalities
- child cyclists - 24.1% of all cyclist fatalities
- child occupants - 4.7% of all occupant fatalities

Table 12 reveals that the contribution of each age group varies by road user category. The 5-9 year olds are the main contributor to pedestrian deaths and injuries. For pedal cyclists, it is the 10-14 age group. For passengers, all three sub-age groups are significant.

TABLE 12
1979 "MEAN" PERCENTAGE OF CHILD 0-14 ROAD DEATH AND ROAD INJURIES FOR 16 OECD MEMBER COUNTRIES

	Pedestrians		Cyclists		Passengers	
AGE	Death	Injury	Death	Injury	Death	Injury
0-4 years	33.6	23.1	4.0	4.4	36.8	31.2
5-9 "	46.4	50.9	30.3	36.3	28.1	33.2
10-14 "	20.0	26.0	57.7	59.3	35.1	35.6
	100%	100%	100%	100%	100%	100%

Source: OECD (1983) "Traffic Safety of Children", (figures derived from tables - ch.2).

Analysis of road deaths by type of road users amongst the 16 member OECD countries in 1979 indicates:

- 44% of the 0-14 year olds killed were killed as pedestrians and this represented 18% of all pedestrian fatalities.

* 35% of the 0-14 year olds killed were killed as occupants and this represented 5% of all occupant fatalities.

* 17% of the 0-14 year olds killed were killed as cyclists and this represented 24% of all cyclist fatalities.

2.2 Australian Accident Data

Over 400 children aged 0-16 are killed on Australian roads each year, and, at least an additional 4500 are seriously injured (i.e., admitted to hospital). The magnitude of the problem is fairly constant from year to year. Furthermore, at least as many again are treated for injuries whilst many more are involved in accidents which go unreported.

TABLE 12A

	CHILD ROAD CASUALTIES	
	Killed	Admitted to Hospital
1980	415	4970*
1981	418	5154**
1982	410	4628
1983	335	4356

Sources: * RACS 1982 "Road Trauma"
** ABS 9405.0 18.4.84

Table 13 presents an analysis of children seriously injured in road accidents by age, sex, and type of road user.

Child passenger injuries represent 47% of all road accident injuries amongst 0-16 year olds. Pedestrians account for 28%, cyclists 16%, motor cyclists 6%, and drivers 2% of serious child road injuries (i.e. admitted to hospital). Analysis by sex of accident reveals that males account for 62% of all accidents victims 0-16, 51% of all passengers injuries 0-16, 61% of all pedestrians injuries 0-16, 81% of all motor cycle injuries 0-16, 83% of all pedal cycle injuries 0-16, and 83% of all driver injuries 0-16.

TABLE 13

AUSTRALIAN CHILD ROAD INJURIES[1] - 1980

Type of Road User	0-4 M.	0-4 F.	5-16 M.	5-16 F.	0-16 M.	0-16 F.	Total
Passengers	273	223	930	919	1203	1142	2345
Pedestrians	178	83	675	456	853	539	1392
Pedal Cyclists	6	1	638	132	644	133	777
Motor Cyclists	5	2	244	57	249	59	308
Drivers	-	-	93	20	93	20	113
Unclassified	1	2	17	15	18	17	35
All users	463	311	2597	1599	3060	1910	4970

Source: RACS (1982) "Road Trauma"
1. Admitted to hospital.

Analysis of road deaths in Australia for 1980 reveals a similar picture to that of serious injuries (i.e. admitted to hospital)

TABLE 14

AUSTRALIAN ROAD DEATHS - 1980

Type of Road User	0-4 Male	0-4 Female	5-16 Male	5-16 Female	0-16 Male	0-16 Female	Total
Passengers	24	23	81	57	105	80	185
Pedestrians	26	12	56	43	82	55	137
Pedal Cyclists	1	-	41	11	42	11	53
Motor Cyclists	-	-	21	4	21	4	25
Drivers	-	-	8	3	8	3	11
Unclassified	-	-	-	4	-	4	4
	51	35	207	122	258	157	415

Source: RACS (1982) "Road Trauma"

A comparison of child road deaths with child road injuries for 1980 appears in table 15 and confirms the earlier statement that, as far as road user categories are concerned, Deaths and Injuries present a very similar picture.

TABLE 15

TOTAL ROAD USERS 0-16 - 1980

	Deaths %	Injuries 1. %
Passengers	45	47
Pedestrians	33	28
Pedal Cyclists	13	16
Motor Cyclists	6	6
Drivers	3	2
	100%	100%

Source: RACS (1982) "Road Trauma", derived from tables p.15-16.

1. Admitted to hospital.

Whilst there are slight differences in death and injuries by road user category, they are not statistically significant. The same finding also applies for males involved in road accidents.

TABLE 16

PROPORTION OF MALES INVOLVED IN ACCIDENTS 0-16 - 1980

	Deaths	Injuries 1.
All Users	62%	62%
Passengers	51%	57%
Pedestrians	61%	60%
Pedal Cyclists	83%	79%
Motor cyclists	81%	84%
Drivers	83%	73%

Source: RACS (1982) "Road Trauma" derived from tables p.15-16.
1. Admitted to hospital.

The analysis of OECD data reveal that each of the sub-age groups contributes differentially to the child accident statistics. Essentially, the same picture emerges in Australia. The 1976/78 Australian accident rate data reveals that pedestrian accidents peak in the 5-9 age group, and cycle accidents in the 10-14 group, while passenger accidents remain fairly stable across all ages.

TABLE 17

AGE SPECIFIC DEATH RATES (100,000) 1976/78

Type	0-4 Yrs.	5-9 Yrs.	10-14 Yrs.
MV + Pedestrian	4.4	4.9	2.4
MV + MV (Occupants)	2.6	2.1	2.2
MV + Other (inc. cycle & cart)	0.1	0.9	2.0

Source: O'Connor (1982) p.17 derived from Table 1.22.

Recently Jarvis (1983), in analysing the accidents to children on Australian roads, differentiated those accidents in which the child involved is an active participant; viz., as a pedal cyclist or a pedestrian, versus the other very large category of accidents involving children as "other people's accidents" where the child is a passenger in a car.

Jarvis pointed out that, in 1976, children under about 7 years of age are the major pedestrian problem since the rate of road deaths as pedestrians in this age group is over twice that of the middle age groups (7 years - 30 years) and the rate of injury four times for both sexes. With regard to pedal cyclists, he concluded that children of school age, between 7 and 16, are greatly over-represented in pedal cycle accidents. In the 7-16 age group, both death and injury rates for males are 5 to 6 times those for females. The Geelong Bike Plan Study (1978) also found that school children are involved in 72% of all reported bicycle accidents.

2.3 Variation in Australian Patterns by State

Table 9, in section 1.62, indicates that road accident injury rates vary considerably by state, by age, and by sex, with N.S.W., S.A. and Northern Territory having the highest rate per 1,000 children 0-14 in 1978. Similar data is presented in table 18 which reveals that N.S.W., in particular, has a high injury rate amongst the two largest road user categories - passengers and pedestrians.

TABLE 18

AGE SPECIFIC INJURY RATES/100,000 CHILDREN AGED 0-14 YEARS FROM ROAD TRAFFIC ACCIDENTS ACCORDING TO TYPE OF ROAD USER - 1978

Type of Road User	NSW	Vic.	Qld.	W.A.	S.A.	Tas.	ACT.	N.T.
			State					
Driver of M.V.	0.5	0.3	0	4.5	0.6	0	0	0
Motor cyclist	1.3	0.8	1.6	1.2	2.5	1.8	4.5	2.6
Pedal cyclist	39.3	38.9	37.6	20.7	79.1	22.2	49.8	31.3
Passenger	223.7	139.1	139.3	157.1	205.1	125.1	99.6	190.1
Pedestrian	117.3	61.2	44.6	56.3	73.9	69.2	37.7	36.5
Other	0.4	0.6	0	12.0	0.6	0	12.1	0

Source: O'Connor (1982) p.99 Table 3.36

Table 19 shows that the problem faced by N.S.W. occurs across the three age subdivisions for passengers and pedestrians. However, S.A. does have a higher rate than N.S.W. for passengers aged 10-14 years.

TABLE 19

AGE SPECIFIC (0-4, 5-9, 10-14) INJURY RATES/100,000 FOR SELECTED TYPES OF ROAD USER - 1978.

	Road User								
	Pedal Cyclist			Passenger			Pedestrian		
State	0-4	5-9	10-14	0-4	5-9	10-14	0-4	5-9	10-14
N.S.W.	2	38	77	218	224	229	73	156	118
VIC.	1	31	82	113	146	156	43	83	55
QLD.	0	33	77	134	126	158	29	65	38
W.A.	2	15	44	153	150	169	29	70	68
S.A.	4	48	175	176	198	237	42	37	73
TAS.	0	22	42	108	125	141	50	102	47
A.C.T.	0	42	168	88	100	112	18	46	51
N.T.	7	51	36	184	196	191	44	22	46

Source: O'Connor (1982), page 100 Table 3.37

Table 20 presents the most recent data for child road accident rates in the three most populous states. Again the much higher number and rate of accidents involving children 0-16 in N.S.W. warrants further investigation.

TABLE 20

CHILDREN'S CASUALTIES PER 100,000 POPULATION 0-16
(includes deaths and injuries) 1.

Road Users	1981 NSW	1981 VIC	1981 QLD	1982 NSW	1982 VIC	1982 QLD
M.V. Passengers	234	143	133	198	136	121
Pedestrians	107	61	45	95	64	43
Pedal Cyclists	59	60	51	60	65	51
Motor cyclists & Pillion Passengers	17	4	9	19	6	11
	417	268	238	372	271	226
Total Casualties	6055	3055	1644	5449	3013	1593
Total Pop. 000	1440	1113	691	1444	1108	707

Sources: TARU (N.S.W.); RTA (Vic.); DOT (Q'ld.).
1. Includes killed, hospitalised, treated injured and other injured.

TABLE 21

ALL ROAD USER CASUALTIES 1.

Age/Sex Pop2.	N.S.W. 81	N.S.W. 82	VIC. 81	VIC. 82	Q'LD. 81	Q'LD. 82
0-4 (27%)	(981)	(884)	(479)	(461)	(270)	(239)
Male	568	479	264	270	141	133
Female	412	398	215	191	129	106
Sex N.S.	1	7	-	-	-	-
5-7 (18%)	(915)	(786)	(474)	(438)	(212)	(234)
Male	571	455	267	279	124	139
Female	344	325	207	159	88	95
Sex N.S.	-	6	-	-	-	-
8-12 (32%)	(1824)	(1665)	(986)	(946)	(474)	(455)
Male	1029	992	608	556	275	289
Female	795	669	377	390	199	166
Sex N.S.	-	4	1	-	-	-
13-16 (23%)	(2335)	(2114)	(1119)	(1166)	(688)	(665)
Male	1323	1274	649	690	422	388
Female	1012	836	469	475	266	277
Sex N.S.	-	4	1	1	-	-
0-16	(6055)*	(5449)**	(3058)	(3011)	(1644)	(1593)
Male	3491	3200	1788	1795	962	949
Female	2563	2228	1268	1215	682	644

Sources: TARU (NSW), RTA (Vic.), DOT (Q'ld).

1. Includes killed, hospitalised, treated injured, and other injured.
2. Percentage of child population 0-16 inclusive in this age category.

* Includes 1 Sex not specified

** Includes 21 Sex not specified.

2.4 Detailed Casualty Accident Analysis-Three Most Populous States.

Analysis of the most recent data available for the three most populous states, appears in the following tables. The analysis is restricted to these states because they, in total, account for 78% of all road fatalities and an even greater percentage of serious and reported injuries involving children 0-16 years. Furthermore, access to their statistics was readily available in terms of obtaining data for the specific age groups under investigation. The data presented is the most recent available at the time of writing. In preparing the tables in this sub-section of the report, 'child drivers' are excluded (see section 2.42). Deaths, or fatalities, refer to dying within 30 days of a reported road crash and the death is attributable to injuries sustained during the crash. Casualties refer to road deaths and injuries. Injuries involve a variety of degrees. Any person, believed by police to have been hurt in a motor traffic crash has his or her injuries and/or treatment described in the police report of the crash. Injured includes those admitted to hospital, those treated but not admitted and those injured but not treated.

2.41 Age and Sex - (Table 21 - opposite)

Table 21 reveals that somewhat more children aged 0-4 are involved as road casualties than children aged 5-7. However, the extent of this varies by state and does alter somewhat year by year. In these two youngest age groups, males outnumber females and this difference is present for both years across all three states.

Whilst intuitively there is considerable concern about the road safety of younger children (0-7), in terms of numbers these younger children, across time and the three states, account for only between 29% and 35% of all accidents involving children 0-16. It is the older children (8-16) who are over-represented in road casualty statistics. Admittedly, the class intervals are not equal. The 0-7 year olds account for one third of the accidents (for eight years of life) and the 8-16 year olds account for two thirds of the accidents (for nine years of life).

In the older age groups, the incidence of accidents increases quite substantially between the two sub-age groups. Accordingly, the road accident problem, at least in terms of numbers increases with age so that the greatest numbers are the teenagers not the upper primary school aged children nor the younger children. In the older groups, the incidence of males is still considerably greater than females across time and states.

A comparison, in Table 22, of the three most populous states reveals that casualty accidents involving children 0-16 and fatal accidents involving children 0-16 are not spread evenly between the states according to the population aged 0-16.

Victoria has a better record over the two years than the other two states. Queensland is under-represented in "all accidents" but is over-represented in accidents with children 0-16 involving a child death. N.S.W., over the two years, accounts for proportionately more accidents and more fatals than its share of the population aged 0-16 living in the three states.

TABLE 22

COMPARISON OF SHARE* OF ROAD CASUALTIES INVOLVING CHILDREN 0-16 WITH POPULATION 0-16

State	1981 Pop. %	1981 All Casual %	1981 Deaths %	1982 Pop. %	1982 All Casual %	1982 Deaths %
N.S.W.	44.4	56.3	46.2	44.3	54.2	48.7
Vic.	34.3	28.4	31.5	34.0	29.9	27.3
Q'ld.	21.3	15.3	22.3	21.7	15.9	24.0
3 State Total	100%	100%	100%	100%	100%	100%
Base No.	3244**	10,754	327	3259**	10,055	300

Sources: TARU (NSW); RTA (Vic.); DOT (Q'ld).
* Share based on 3 State Total
** 000

2.42 Sex and Age By Main Road User Types

In this section of the report an analysis is made of the three main road user categories (vehicle passengers, pedestrians, pedal cyclists) for the years 1981 and 1982 for the three most populous states. The "other" road user categories (motor cyclists, pillion passengers, car drivers) are excluded because child road casualties in these categories are small in number representing three percent of all child (0-16) road casualties. Statistical analysis of these road user groups is not feasible. Over 90% of all child road users killed or injured as drivers, motorcycle riders or pillion passengers are aged 13-16 years. These "other" category are primarily males aged 13-16 years and mostly involve motor cycles. Even so, the "other" category still only accounts for less than 10% of the 13-16 age group.

TABLE 24

VEHICLE PASSENGER CASUALTIES* 1. 1981-82

Age/Sex	Pop 2.**	1981 N.S.W.	1981 VIC.	1981 QLD.	1982 N.S.W.	1982 VIC.	1982 QLD.
0-4	(27%)	(726)	(341)	(209)	(631)	(323)	(181)
Male		395	171	96	310	177	90
Female		330	170	113	314	146	91
Sex N.S.		1	-	-	7	-	-
5-7	(18%)	(455)	(249)	(113)	(368)	(205)	(104)
Male		244	114	59	180	109	55
Female		211	135	54	184	96	49
Sex N.S.		-	-	-	4	-	-
8-12	(32%)	(874)	(471)	(229)	(786)	(409)	(205)
Male		385	225	108	367	178	101
Female		489	246	121	417	231	104
Sex N.S.		-	-	-	2	-	-
13-16	(23%)	(1340)	(568)	(367)	(1105)	(577)	(362)
Male		591	255	175	494	241	157
Female		749	312	192	607	335	205
Sex N.S.		-	1	-	4	1	-
0-16		(3395)	(1629)	(918)	(2890)	(1514)	(852)
Male		1615	765	438	1351	705	403
Female		1779	863	480	1522	808	449
Sex N.S.		1	1	-	17	1	-
(Percentages)							
0-4		21	21	23	22	21	21
5-7		13	15	12	13	14	12
8-12		26	29	25	27	27	24
13-16		40	35	40	38	38	43

Sources: TARU (NSW); RTA (Vic.); DOT (Q'ld.).

* Includes killed, hospitalised, treated injured, and other injuries.

** Percentage of child population 0-16 inclusive in this age category.

In interpreting the tables in all subsections of section 2.4, it must be noted that, the age categories employed in the analysis do not contain equal intervals in terms of number of years, nor do they contain equal numbers of children 0-16; i.e. 4 age groups each with 4 year intervals would result in each of the four groups representing 25% of the population aged 0-16. The age group 0-16 spans 17 years. The distribution of the ages across the three most populous states is almost identical.

TABLE 23

1981 POPULATION DISTRIBUTION OF CHILDREN AGED 0-16
(Percentages)

Age Category	(years)	N.S.W. %	VIC. %	Q'LD. %
0-4	(5)	27.2	26.6	27.2
5-7	(3)	17.5	17.3	17.5
8-12	(5)	32.0	32.3	32.2
13-16	(4)	23.3	23.8	23.1
Total	17	100%	100%	100%
Base No. (000)		1440	113	691

Source: APASCO Demographic Information System.

2.421 Vehicle Passengers

According to table 24 (opposite), females are only marginally more likely than males to be involved in passenger accidents. The least involved in passenger accidents are the 5-7 age group.

The incidence of occupant accidents amongst the older age groups, and especially the 13-16 age group, indicates that it is these older children who are the biggest problem as occupants.

Table 25 reveals that a significant level of passenger casualties is present in both sexes and across virtually all age groups. Any countermeasure aimed at solving the problem could also consider drivers as a key target rather than any one specific child age group.

TABLE 25

VEHICLE PASSENGER CASUALTIES (1981/82)
(Percentages)

		N.S.W.		VIC.		Q'LD.		Pop.
Age	Years	81	82	81	82	81	82	*
		%	%	%	%	%	%	
0-4	(5)	21	16	21	15	16	15	27
5-7	(3)	13	14	15	15	13	15	18
8-12	(5)	26	31	29	31	29	28	32
13-16	(4)	40	39	35	39	42	42	23
TOTAL	17	100	100	100	100	100	100	100
BASE NO.		3395	2890	1629	1514	918	852	

Sources: TARU (NSW); RTA (Vic.); DOT (Q'ld).
* Percentage of child population (0-16) in each age group.

A comparison of fatals with all casualties in table 26 reveals a somewhat similar picture except that children 0-4 years of age are over-represented in fatals. However, caution must be exercised in interpretation because of the small base numbers.

TABLE 26

VEHICLE PASSENGER ACCIDENTS

(Percentage of children 0-16 involved in road accidents or fatalities)

	1981					
	N.S.W.		VIC.		Q'LD.	
Age	All	Fatals*	All	Fatals*	All	Fatals*
	%	%	%	%	%	%
0-4	21	33	21	37	23	25
5-7	13	9	15	18	12	25
8-12	26	17	29	13	25	12
13-16	40	41	35	32	40	38
0-16	100	100	100	100	100	100
Male	48	48	47	47	48	48
Female	52	52	53	53	52	52
Base No.	3395	66	1629	38	918	32

	1982					
	N.S.W.		VIC.		Q'LD.	
AGE	All	Fatals*	All	Fatals*	All	Fatals*
	%	%	%	%	%	%
0-4	22	25	21	39	21	27
5-7	13	6	14	14	12	10
8-12	27	17	27	28	24	29
13-16	38	52	38	19	43	34
0-16	100	100	100	100	100	100
Male	47	45	45	56	47	66
Female	53	55	55	44	53	34
Base No.:	2890	77	1514	36	852	41

Sources: TARU (NSW); RTA (Vic); DOT (Q'ld.).
*Caution: Small Base Numbers.

Considering the three most populous states as a total, over the two years 1981 and 1982, N.S.W. is grossly over-represented in vehicle passenger casualties when compared with the incidence of children 0-16 living in N.S.W.

TABLE 28

PEDESTRIAN CASUALTIES* 1981-82

		1981			1982		
Age/Sex	Pop. **	N.S.W.	VIC.	QLD.	N.S.W.	VIC.	QLD.
0-4	(27%)	(241)	(133)	(58)	(233)	(119)	(55)
Male		161	89	42	156	81	41
Female		80	44	16	77	38	14
Sex N.S.		-	-	-	-	-	-
5-7	(18%)	(363)	(153)	(72)	(301)	(155)	(92
Male		243	99	46	182	105	54
Female		120	54	26	118	50	38
Sex N.S.		-	-	-	1	-	-
8-12	(32%)	(572)	(232)	(122)	(517)	(250)	(101
Male		332	152	75	313	142	70
Female		250	80	47	202	108	31
Sex N.S.		-	-	-	2	-	-
13-16	(23%)	(376)	(178)	(61)	(328)	(186)	(59)
Male		190	83	38	185	101	35
Female		186	95	23	143	85	24
Sex N.S.		-	-	-	-	-	-
0-16		(1552)	(696)	(313)	(1379)	(710)	(307)
Male		916	423	201	836	429	200
Female		636	273	112	540	281	107
Sex N.S.		-	-	-	3	-	-
				(Percentages)			
0-4		16	19	19	17	17	18
5-7		23	22	23	22	22	30
8-12		37	33	39	37	35	33
13-16		24	26	19	24	26	19

Sources: TARU (NSW); RTA (Vic.); DOT (Q'ld.).

* Includes killed, hospitalised, treated injured, and other injured.

** Percentage of child population 0-16 inclusive in this age category.

Not only is N.S.W. over-represented in vehicle passenger casualties, it is also over-represented in vehicle passenger fatalities involving children 0-16. Queensland, whilst not over-represented in casualties, is over-represented in child fatalities. Victoria had the best record over these two years. Of course, the small base numbers account for the movements and differences.

TABLE 27

COMPARISON OF SHARE* OF VEHICLE PASSENGER CASUALTIES INVOLVING CHILDREN 0-16 WITH POPULATION 0-16
(Percentages)

	1981			1982		
		ALL			ALL	
State	Pop.	Pass.Acc.	Fatals	Pop.	Pass.Acc.	Fatals
	%	%	%	%	%	%
N.S.W.	44.4	57.1	48.5	44.3	55.0	50.0
VIC.	34.3	27.4	28.0	34.0	28.8	23.4
Q'LD.	21.3	15.5	23.5	21.7	16.2	26.6
3 State Total	100%	100%	100%	100%	100%	100%
Base No.:	3244**	5941	136	3259**	5256	154

Sources: TARU (NSW); RTA (Vic.); DOT (Q'ld.).
*Share based on 3 state Total.
** 000

2.422 Pedestrians

The pedestrian problem (Table 28 opposite) is skewed towards males. The 8-12 age group is also considerably over-represented in casualties but the problem is sizeable in all age groups. Table 29 provides a comparative table using percentages.

The male bias in pedestrian casualties is even greater when fatalities are examined. Table 29 suggests that, whilst pedestrian casualties occur in all age groups, the least likely to be involved are young girls 0-7 years of age.

TABLE 29

PEDESTRIANS CASUALTIES 1981
(Percentage of each sex/age group involved as casualties or fatalities).

	N.S.W.		VIC.		Q'LD	
	All	Fatals*	All	Fatals*	All	Fatals*
Age/Sex	%	%	%	%	%	%
0-4 Male	10	16	13	29	13	11
0-4 Female	5	11	6	8	5	5
5-7 Male	16	22	14	16	15	33
5-7 Female	8	9	8	-	8	11
8-12 Male	21	20	22	21	24	11
8-12 Female	16	4	11	8	15	-
13-16 Male	12	9	12	10	12	17
13-16 Female	12	9	14	8	7	11
0-16	100%	100%	100%	100%	100%	100%
Male	59	67	61	76	64	72
Female	41	33	39	24	36	28
Base No.	1552	55	696	38	313	18

Sources: TARU (N.S.W), RTA (Vic.), DOT (Q'ld).
* Caution: Small Base Numbers.

The same patterns emerge over time as shown in table 30.

TABLE 30

PEDESTRIAN CASUALTIES 1982
(Percentage of each sex/age groups involved in accidents or fatalities)

Age/Sex	N.S.W. All	N.S.W. Fatals*	VIC. All	VIC. Fatals*	Q'LD All	Q'LD Fatals*
	%	%	%	%	%	%
0-4 Male	11	29	11	18	13	28
0-4 Female	6	12	5	18	5	6
5-7 Male	13	16	15	18	18	11
5-7 Female	9	12	7	7	12	22
8-12 Male	23	12	20	7	23	17
8-12 Female	15	6	15	4	10	-
13-16 Male	13	10	14	21	11	17
13-16 Female	10	4	12	7	8	-
Total 0-16	100%	100%	100%	100%	100%	100%
Male	61	67	60	64	65	72
Female	39	33	40	36	35	28
Base No.	1379	51	710	28	307	18

Sources: TARU (NSW9, RTA (Vic.), DOT (Q'ld.).
* Caution Small Base Numbers.

The variations between 1981 and 1982 in any one age sex/group for fatalities reflects the very small base number of fatalities.

A comparison in table 31 of pedestrian casualties and pedestrian deaths involving children 0-16 with the population aged 0-16 in the three states again reveals an uneven distribution.

Based on share of child population in the 3 most populous states, N.S.W. again contributes a greater share of all child pedestrian casualties and pedestrian fatalities aged 0-16 years. Victoria is under-represented in both casualties and fatalities except in 1981 where its share of 3 state fatalities matched its share of 3 state population. Queensland has a very low incidence of pedestrian casualties and a low incidence of pedestrian fatalities. This may reflect the earlier observations that pedestrian casualties and fatalities are much more likely to occur in urban or metropolitan areas.

TABLE 31

COMPARISON OF SHARE* OF PEDESTRIAN CASUALTIES INVOLVING CHILDREN 0-16 WITH POPULATION 0-16

(Percentages)

State	1981 Pop.	1981 Ped.Acc.	1981 Fatals	1982 Pop.	1982 Ped. Acc.	1982 Fatals
	%	%	%	%	%	%
N.S.W.	44.4	60.6	49.6	44.3	57.6	52.6
VIC.	34.3	27.2	34.2	34.0	29.6	28.9
Q'ld.	21.3	12.2	16.2	21.7	12.8	18.5
3 State Total	100	100	100	100	100	100
Base No.	3244**	2561	111	3259**	2396	97

Sources: TARU (NSW), RTA (Vic.), DOT (Q'ld.).

* Share based on 3 State Total

** 000

TABLE 32

PEDAL CYCLE & PILLION PASSENGER CASUALTIES* 1981-82

		1981			1982		
Age/Sex	Pop **	N.S.W.	VIC.	Q'LD.	N.S.W	VIC.	Q'LD
0-4	(27%)	(12)	(5)	(3)	(16)	(18)	(3)
Male		10	4	3	11	12	2
Female		2	1	-	5	6	1
5-7	(18%)	(94)	(72)	(27)	(116)	(77)	(37)
Male		82	54	19	92	64	30
Female		12	18	8	23	13	7
Sex N.S.		-	-	-	1	-	-
8-12	(32%)	(365)	(281)	(119)	(344)	(280)	(144)
Male		312	230	90	296	230	115
Female		53	51	29	48	50	29
Sex N.S.		-	1	-	-	-	-
13-16	(23%)	(391)	(324)	(201)	(434)	(345)	(173)
Male		344	273	164	392	294	142
Female		47	51	37	42	51	31
0-16		(862)	(683)	(350)	(910)	(720)	(357)
Male		748	561	276	771	600	289
Female		114	121	74	118	120	68
Sex N.S.		-	1	-	1	-	-
				Percentages			
0-4		1	1	1	1	2	1
5-7		11	11	8	13	11	10
8-12		43	41	34	38	39	40
13-16		45	47	57	48	48	49

Sources: TARU (NSW), RTA (Vic.), DOT (Q'ld.).

* Includes killed, hospitalised, treat injured, and other injured.

** Percentage of child population 0-16 inclusive in this age category.

2.423 Pedal Cyclists

The 3 state data for 1981 and 1982 appears in table 32 opposite. A comparison of all casualties versus fatals follows in table 33.

Victoria has more pedal cycle fatalities, involving children 0-16 years, than does Queensland or New South Wales. The 1982 finding was also true for 1981 (although not shown in the table).

TABLE 33

PEDAL CYCLE CASUALTIES 1982
All Accidents

	N.S.W.		VIC.		Q'LD.	
	Ped. Accid. %	Fatals No.	Ped. Accid. %	Fatals No.	Ped. Accid. %	Fatals No.
0-4 Males	1	-	2	-	>1	-
0-4 Females	>1	1	1	-	>1	-
5-7 Males	10	2	9	4	8	4
5-7 Females	2	-	2	-	2	-
8-12 Males	33	4	32	2	32	2
8-12 Females	5	-	7	-	8	2
13-16 Males	44	3	41	10	40	4
13-16 Females	4	-	7	1	9	-
Total 0-16	100%	10	100%	17	100%	12
Male	88	9	83	16	81	10
Female	12	1	17	1	19	2
Base No.	910	10	220	17	357	12

Sources: TARU (NSW), RTA (Vic.), DOT (Q'ld.).

Any analysis of bicycle casualty data should be carried out with considerable caution because of the very high level of non-reporting (see section 1.4). Bouvier (1984) estimated that bicycle accidents all ages are around 900,000 for Victoria alone. This estimate was based on the authors attendance at BMX and other cycling rallies and a study of the St. John Ambulance case sheets for these meets. He refers to the accident iceberg where statistics reveal only the tip. It is not possible to determine whether the level of non-reporting varies by geographic area.

On the basis of the casualties data available, the relative situation between the three most populous states appears in table 34.

TABLE 34

COMPARISON OF SHARE* OF
PEDAL CYCLE & PILLION PASSENGER CASUALTIES
INVOLVING CHILDREN 0-16 (Percentages)

State	1981 Pop.	1981 Cycle Accid.	1981 Fatals ***	1982 Pop.	1982 Cycle Accid.	1982 Fatals ***
	%	%	%	%	%	%
N.S.W.	44.4	45.5	28.0	44.3	45.8	25.6
VIC.	34.3	36.0	44.0	34.0	36.2	43.6
Q'LD.	21.3	18.5	28.0	21.7	18.0	30.8
3 State Total	100	100	100	100	100	100
Base No.**	3244	1895	50	3259	1987	39

Source: TARU (NSW), RTA (Vic.), DOT (Q'ld.).
* Share based on 3 State Total
** 000
*** Caution: Percentaged on very small base number.

Of the three major road user categories, where children 0-16 are involved as casualties Pedal cycle casualties most closely approximate population incidences for the three most populous states (see tables 27, 31, 34). However, with regard to fatalities, N.S.W. had the best record for the years 1981 and 1982 and Victoria the worst. This data takes no account of risk or exposure, since no such data is available. One possible proxy measure for exposure is bicycle ownership or bicycle sales, but no comparable statistics appear to exist.

2.43 Road User Types

Analysis of all child casualties or all accidents involving child fatalities reveals that two road user categories account for the bulk of 'reported' accidents. A third road user category is also significant and very likely to be much more significant than revealed by the casualty statistics (see section 1.4). A national picture for "all" child road accidents and "all" fatalities appeared in tables 13 and 14 (in section 2.2). In the analysis which follows "drivers" are excluded since most child drivers are driving illegally (including motorcycle drivers). Table 14 (section 2.2) revealed that 11 drivers 0-16 years of age were killed in Australia in 1980 while table 13 indicates that 113 were injured. "Drivers" represents around 2% of fatals and 2% of all casualties involving children 0-16 years of age.

TABLE 35

ALL CASUALTIES BY TYPE OF ROAD USERS

Road Users	N.S.W. M.	N.S.W. F.	N.S.W. Total	VIC. M.	VIC. F.	VIC. Total	Q'LD. M.	Q'LD. F.	Q'LD. Total
1981									
Veh.Pass.	1615	1779	3395*	765	863	1629*	438	480	918
Pedest	916	636	1552	423	273	696	201	112	313
Cyc./P.P.	748	114	862	558	121	680*	276	74	350
Mot cyc	163	5	168	39	11	50	47	16	63
Pill Pass.	49	29	78						
Total	3491	2563	6055	1785	1268	3055	962	682	1644
1982									
Veh.Pass.	1351	1522	2890*	705	808	1514*	403	449	852
Pedest	836	540	1379*	429	281	710	200	107	307
Cyc./P.P.	791	118	910*	600	120	722*	289	68	357
Mot cyc	188	6	194						
Pill pass.	34	42	76	57	20	67	57	20	77
Total	3200	2228	5449	1822	1233	3013	949	644	1593

Sources: TARU (NSW), RTA (Vic.), DOT (Q'ld.).
* Includes sex not stated

Variations also exist between the states regarding the relative magnitude of the road user casualty categories. Vehicle passengers are the single biggest problem, by far, across the three most populous states. However the picture changes significantly between the states for the next two major problems but is consistent for the two years under investigation.

One in every two road accidents involving a child 0-16 years of age occurs as a "passenger" in a vehicle. Pedestrian accidents and pedal cycle accidents account for most of the remainder.

TABLE 36

ALL CASUALTIES 1981-82
(Percentage of Children 0-16 years of age in each category of road user).

Category of User	N.S.W. 81	N.S.W. 82	VIC. 81	VIC. 82	Q'LD. 81	Q'LD. 82
	%	%	%	%	%	%
Vehicle passengers	56	53	53	50	56	54
Pedestrians	26	26	23	23	19	19
Ped. cycl./Pill.P.	14	16	22	24	21	23
Motor cyclists/	2.8	3.6				
Pillion passengers	1.2	1.4	2	3	4	4
	100%	100%	100%	100%	100%	100%
Base No.	6055	5449	3055	3013	1644	1593

Sources: TARU (NSW), RTA (Vic.), DOT (Q'ld.).

Analysis of fatalities (table 37) reveals a similar picture, except for Victoria where, in relative terms, pedestrians and pedal cyclists account for a greater proportion of fatalities than accidents.

TABLE 37

FATALITIES 1981-82
(0-16 years of Age)

Category of User	N.S.W. No.	N.S.W. %	VIC. No.	VIC. %	Q'LD. No.	Q'LD. %
1981						
Vehicle Passengers	66	45	38	38	32	45
Pedestrians	55	37	38	38	18	25
Ped.Cyc./Pill.Pass.	14	10	22	22	14	20
Motor cyclists/	8	5				
Pillion passengers	4	3	2	2	7	10
Total Killed	147	100	100	100	71	100
1982						
Vehicle Passengers	77	53	36	44	41	57
Pedestrians	51	35	28	34	18	25
Ped.Cyc./Pill.Pass.	10	7	17	21	12	17
Motor Cyclists/	4	3				
Pillion passengers	4	3	1	1	1	1
Total Killed	146	100%	82	100%	72	100%

Sources: TARU (NSW), RTA (Vic.), DOT (Q'ld.).

TABLE 39

ALL CASUALTIES

(METRO) VS (NON-METRO)

1981

Record User Category	NSW Metro(1) No.	%	NSW Other No.	%	VIC Metro(2) No.	%	VIC Other No.	%	QLD Metro(3) No.	%	QLD Other No.	%
M.V. Passengers	1833	(48)	1562	(69)	1002	(47)	627	(67)	353	(45)	565	(65)
Pedestrians	1257	(33)	295	(13)	592	(28)	104	(11)	208	(27)	105	(12)
Pedal Cyclists & Pillion Passengers	588	(16)	274	(12)	490	(23)	190	(20)	189	(24)	161	(19)
Motorcyclists & Pillion Passengers	124	(3)	122	(6)	30	(2)	20	(2)	27	(4)	36	(4)
All Users*	3802	(100)	2253	(100)	2114	(100)	940	(100)	777	(100)	867	(100)
Male	2217	(59)	1220	(54)	1259	(60)	526	(56)	477	(61)	485	(56)
Female	1530	(41)	1033	(46)	854	(40)	414	(44)	300	(39)	382	(44)

1982

Record User Category	NSW Metro(1) No.	%	NSW Other No.	%	VIC Metro(2) No.	%	VIC Other No.	%	QLD Metro(3) No.	%	QLD Other No.	%
M.V. Passengers	1482	(44)	1408	(67)		(44)	593	(64)	350	(45)	502	(62)
Pedestrians	1070	(32)	309	(15)	586	(28)	124	(13)	202	(13)	105	(13)
Pedal Cyclists & Pillion Passengers	637	(19)	273	(13)	533	(26)	189	(20)	196	(20)	161	(20)
Motorcyclists & Pillion Passengers	135	(4)	135	(6)	40	(2)	27	(3)	30	(4)	47	(5)
All Users*	3324	(100)	2125	(100)	2080	(100)	933	(100)	778	(100)	815	(100)
Male	1982	(60)	1218	(57)	1272	(62)	523	(56)	491	(63)	458	(56)
Female	1327	(40)	901	(43)	805	(38)	410	(44)	287	(37)	357	(44)

(i) Metro defined as Sydney Statistical Division, Wollongong Statistical Division and Shell Harbour L.G.A., Newcastle Statistical Division and Lake Macquarie L.G.A. Other=rest of New South Wales

(ii) Metro defined as Melbourne Statistical Division, Geelong City Statistical Division plus L.G.A.'s. Ballerineo(103) Corio(106) Geelong West(108) Newtown(110) Queenscliff(112)

(iii) Metro defined as Brisbane Statistical Division and Gold Coast

* Includes 'sex not stated'

Over the two years a consistent picture emerges. There is a possibility, however, that the proportion of vehicle passengers could be declining and pedal cyclists and pedestrians rising. Table 38 reveals that, over these two years, the total number of child casualties and child fatalities declined slightly in each of the three most populous states.

TABLE 38

ALL CASUALTIES 1981-82
(Children 0-16 years of age)

Category of User	N.S.W.		VIC.		Q'LD.	
	81	82	81	82	81	82
Vehicle passengers	3395	2890	1629	1514	918	852
Pedestrians	1552	1379	696	710	313	307
Ped.cyc./Pill.Pass.	862	910	680	722	350	357
Mot.cyc./Pill.Pass.	246	270	50	67	63	77
Total Casualties	6055	5449	3055	3013	1644	1593

Sources: TARU (NSW), RTA (Vic.), DOT (Q'ld.).

2.44 Metro versus Non-Metro

The analysis, thus far, has treated each state as a homogeneous entity. Victoria and N.S.W. are characterised by a sizeable proportion of the population living in metropolitan or urban areas. Queensland's population tends to be more decentralised.

Table 39 (opposite) provides road user casualty data for each of the three most populous states split between metro and non metro. The precise definitions occur in the footnotes. The table reveals that the pedestrian problem is restricted primarily to metro areas whilst vehicle passengers account for considerably more casualties in the country. Pedal cycle casualties are more predominant in the metro areas but are still significant in country areas.

In terms of overall number of casualties the proportion of casualties metro versus country appears in Table 40.

TABLE 41

ALL CASUALTIES

METRO VS NON-METRO

1981

AGE	NSW (1) Metro* No. (%)	NSW Other No. (%)	VIC (2) Metro* No. (%)	VIC Other No. (%)	QLD (3) Metro* No. (%)	QLD Other No. (%)
0-4	602(16)	379(17)	317(15)	162(17)	114(15)	156(18)
5-7	606(16)	309(14)	335(16)	139(15)	96(16)	116(13)
8-12	1201(32)	623(28)	698(37)	285(30)	251(32)	222(26)
13-16	1393(37)	942(42)	764(36)	355(38)	314(41)	375(43)
Total 0-16	3802(100)	2253(100)	2114(100)	941(100)	777(100)	867(100)

1982

AGE	NSW (1) Metro* No. (%)	NSW Other No. (%)	VIC (2) Metro* No. (%)	VIC Other No. (%)	QLD (3) Metro* No. (%)	QLD Other No. (%)
0-4	646(14)	429(20)	301(14)	160(17)	116(15)	123(15)
5-7	513(16)	273(13)	305(15)	133(14)	119(15)	115(14)
8-12	1073(32)	592(28)	691(33)	255(27)	243(31)	212(26)
13-16	1274(38)	840(39)	783(38)	385(41)	300(39)	365(45)
Total 0-16	3324(100)	2125(100)	1080(100)	933(100)	778(100)	815(100)

(i) Metro defined as Sydney Statistical Division, Wollongong Statistical Division and Shell Harbour L.G.A., Newcastle Statistical Division and Lake Macquarie L.G.G. Other = rest of New South Wales.

(ii) Metro defined as Melbourne Statistical Division, Geelong City Statistical Division plus L.G.A.'s. Ballerineo (103), Corio (106), Geelong West (108), Newtown (110), Queenscliff (112).

(iii) Metro defined as Brisbane Statistical Division and Gold Coast.

The table reveals a remarkably different picture in each state for fatalities suggesting that resources aimed at the child road accident problem may require entirely different allocations in each state.

TABLE 40

PERCENTAGE OF CHILD ROAD ACCIDENTS 0-16
METRO Vs NON METRO 1981

	Total Pop.*	Population* 0-16	All Child Accidents	Fatals
	%	%	%	%
N.S.W				
Metro	69	67	63	50
Other	31	33	37	50
VIC.				
Metro	74	72	69	62
Other	26	28	31	38
Q'LD.				
Metro	55	52	47	37
Other	45	48	53	63

Sources: * APASCO Demographic Information Services
TARU (NSW), RTA (Vic.), DOT (Q'ld).

A comparison in Table 41 (opposite) of Metro versus Country accident data between 1981 and 1982 reveals fairly consistent patterns in the three most populous states in terms of age distribution of accidents 0-16 and category of road user. Furthermore, the age profile does not vary significantly by geographic location.

2.45 Summary Analysis

This sub-section attempts to draw together some of the threads of section 2 thus far. In order to assist this process summary Table 1 is applied. This table is a useful means of keeping the key ages and road users groups in mind. The table refers only to fatalities, for Australia as a whole, for 1981.

Summary Table 1

CHILDREN KILLED IN ROAD CRASHES - 1981 - AUSTRALIA
(Numbers)

Age of Child	No. of Years	Road User Type Pass.	Ped.	Cyc. P.P.	M.Cyc. & P.P.	Driv.	Other	Total
0-4 yrs	(5)	43	38	2	-	-	8	91
5-7 "	(3)	16	31	15	-	-	7	69
8-12 "	(5)	24	34	27	1	-	5	91
13-16 "	(4)	65	31	21	21	13	10	161
0-16	(7)	148	134	65	22	13	30	412
17-18	(2)	115	13	3	59	113	13	317
0-18	(19)	263	147	68	81	126	43	729

Source: DOT Fatal File 1981.

- Road accidents involving children 0-16 as casualties (fatals or injured) are primarily related to the child being a passenger in a vehicle, a pedestrian or a pedal cyclist.

* In total, children 0-16 are less of a problem than are young people 17-25. Young people are casualties primarily as drivers, motorcycle riders and vehicle passengers, but not as pedestrians and pedal cyclists.

* The child road accident problem really is a whole set of different problems. Children are not a homogeneous group of road users. Each of the various sub-age groups pose an entirely different set of behaviour patterns and each contribute quite differently to the total accident statistics in terms of road user categories:

  - child vehicle passengers account for the greatest number of deaths and reported road injuries (over 45%);

  - child pedestrian accidents account for approximately one third of child road deaths and around 30% of reported child road injuries;

  - child pedal cyclists account for approximately one sixth of all reported child road accidents;

  - almost 10% of child road deaths and road injuries involve children as drivers of cars or riders/pillion passengers on motor cycles;

- there is considerable variation by state in the accident pattern. N.S.W., in particular, has a high accident rate for the two largest categories of child road user accidents; viz., vehicle passengers and pedestrians;

- more children 0-4 are involved in road accidents than children aged 5-7 and males outnumber females.

Vehicle Passengers

* Males and females are almost equally involved.

* The least involved are the 5-7 age group.

* The largest incidence of passenger accidents involve the 13-16 age group. They represent 23% of the population of children, and around 40% of the passenger accidents or passenger deaths.

Pedestrians

* The pedestrian problem is skewed towards males, especially in child pedestrian deaths.

* The 8-12 age group is considerably over-represented in accidents, but the problem is sizeable in all age groups.

* The least likely group to be involved in pedestrian accidents are females aged 0-7 years of age.

Pedal Cyclists

* Over 80% of child accidents or deaths involve a male pedal cyclist.

* The largest number of accidents (over 40%) involve teenage (13-16 years) males who represent 12% of the child population. Males aged 8-12 years account for 33% of the accidents and 16% of the population.

  N.B. Caution should be exercised in pedal cycle statistics because of the high level of non-reporting.

Metro vs Non-Metro

* The child pedestrian problem is restricted primarily to metropolitan areas.

* Child vehicle passenger accidents account for proportionately more of non-metro accidents.

* Pedal cycle accidents are more predominant in the metropolitan areas but are still significant in non-metro areas.

* Analysis of metro versus non metro varies dramatically between each of the three most populous states suggesting that resources aimed at the child road accident problem could require entirely different allocations in each state.

2.5 Risk and Exposure

The high accident involvement rates of children 0-16 as pedestrians and cyclists, in particular, is likely to be partially explained by high levels of exposure. Exposure studies are largely non-existent, both in Australia and Overseas. Any comparisons of accident rates between various states, or between countries, should take into account exposure and risk since these have a direct bearing on accident numbers and rates. Few exposure studies have been carried out in Australia. The only studies published to date are those by Cameron, Stanton, & Milne (1976), and Cameron and Milne (1978). A further study conducted by the N.S.W. Traffic Accident Research Unit, has to date only published preliminary results (Jamieson, Croft, & Herbert 1981). Wigan (1983a,b,c) provides exposure values for bicycle travel but not for the relationship between accident rates and exposure of children on bicycles.

Exposure measures are needed to diagnose which groups require special countermeasures; i.e., to define more precisely the target groups for public education programs or other countermeasures. For instance, boys have more accidents than girls as pedal cyclists or pedestrians but this difference might be largely due to differences in levels of exposure. Accordingly, countermeasures should not be based on sex differences alone.

Additionally, exposure measures enable analysis of accident data so as to determine 'where' and 'when' exposure and risk is greatest; e.g., 'where' do pedestrians cross roads?; etc. This data enables risk levels to be attached to various courses of action. For instance, the relative danger to pedestrians by 'types of roads' can be assessed. Jamieson, et. al., (1981) in their Sydney exposure study, compared the relative risk levels for pedestrians (all ages) across three categories of roads - Arterial routes, Collector routes, and Local streets. They pointed out, crash records show that these road classes account for 42%, 22%, and 36% respectively of all pedestrian crashes in Sydney. However, if exposure is measured (pedestrians and vehicles) and an index calculated this can be related to crash experience by road class. They concluded:

> "While the Local Streets have a lower pedestrian crash rate than do Collector Roads or Arterial Routes they also have a much lower exposure index - so much so that, in terms of the relative risk experienced by pedestrians using those roads, they may be regarded as the most dangerous." (Jamieson, et.al. 1981, p.4).

Thus, whilst intuitively 'Main' roads are regarded as more dangerous, proportionately more pedestrian casualties occur on 'Local' streets when the number of pedestrians and vehicles using the different classes of roads are taken into account. Other supportive data on the importance of local streets appears in the work of Andreassend, Hoque & Young (1984) where almost 1 in every 2 pedestrian accidents in local streets involved a child 0-8 years. Not only did Andreassend et. al. examine accidents by age and class of road, they also examined accidents on links and intersections by road classification. Fifty-five percent of intersection accidents involved a local road. Unfortunately it is not possible from existing computerised accident records to determine which approach the accident occurred on the local road or the arterial. However, they suggest that their analysis of Metro Melbourne data for 1981, would support a hypothesis that the pedestrian problem is located on local roads rather than secondary arterials.

The primary purpose of exposure data is to compute an estimate of risk for target groups and target situations. Gunnarsson defined risk:

> "as the potential (probability) for the occurrence of an event having undesirable or negative consequences in connection with a certain given activity". (Gunnarsson 1982, p.105)

The exposure data itself needs to be used in conjunction with appropriate accident data so as to compute estimates or indices of risk. The OECD (1983) Report "Traffic Safety and Children", in addition to providing a detailed rationale for the need for exposure studies, provides a brief summary of the major studies carried out (see OECD, 1983, pp. 30-31).

A number of studies on risk (including Goodwin and Hutchinson, 1977; Howarth, Routledge and Repetto-Wright, 1974; Brog and Kuffner, 1982; Jonah, 1981; and Van der Molen, 1981; all cited OECD Report (1983), have found that the accident rate/exposure for child pedestrians is higher than for older people, and is higher for males than females. This can also be held true for cyclists (Hvoslef cited, in OECD, 1983)

Sadler's (1969) large scale survey questionnaire study amongst mothers in relation to their children's traffic behavior in England, Wales and Scotland, found a high degree of exposure amongst children for various activities. Some of her findings were; 11% of 2 year olds and 43% of 8 year olds rode tricycles or cycles on roads; one third to one half of 3-8 year olds playing area included the street (as reported by their mother), half to two thirds of 3-8 year olds did play on the street; of under 8 year olds, 14% went to the shop on their own and 24% ran messages; 4% of 2 year olds went to the ice-cream van alone and this rose to 94% by the age of 8; two thirds of children walked to and from school, with one third to two thirds unaccompanied or with another child less than 10 years of age (the very young generally walked with a parent); three quarters either played or visited after school, away from home.

Sandels (1975), in her Swedish studies, reported that more than half of the 3-4 year olds were unaccompanied by an adult and often if they were accompanied, the adult did not have physical control of the child. These figures indicate the high degree to which children, especially the primary school age grouping are 'exposed' to traffic.

Howarth, Routledge, & Repetto-Wright (1974), in the United Kingdom, found a slight increase in the measure of risk for 5-6 year olds (due to increased exposure with commencing school) and that risk decreased with increasing age. They found that 5 year old males were six times more at risk than their 10 year old counterparts; whilst for females the risk was only three times as great. The greatest number of accidents occurred to males aged 5-7 years.

Other studies support the general finding relating to children's school journeys; viz., that exposure to traffic risk increases with age and that there are age differences in road-crossing strategies (Grayson 1975(b); Routledge, Repetto-Wright & Howarth 1974(a) & (b) and 1976 (a)).

Chapman, Foot and Wade (1980) report an observational study in the (9 days) summer school holidays of 1979 and pre-holidays (10 days). They found that boys are more exposed to traffic than girls because they use the streets more for recreational purposes. The sex differences were greatest in the 5-10 years age group. They found no evidence for the adventurous male stereotype, nor did boys run anymore than girls.

Routledge, et. al., (1976 (a)), in a methodological paper, reviewed four techniques used in studies of child pedestrian exposure. Whilst the techniques were different there is considerable agreement as to the major findings:

* Marked increase in exposure between ages 5-11 years.
  "Young children are therefore very much more at risk whenever they cross a road than would appear from the raw accident statistics. Children under the age of 5 are up to 13 times more at risk than 5-7 year olds who are 40 times more at risk than adults aged 20-50 years...."

* Little difference in exposure between boys and girls especially between 5-7 year olds where the difference in accident statistics is so striking.
  ".... the much greater number of accidents to young children and especially to young boys must be explained largely by differences in behaviour when crossing roads rather than by differences in exposure."

* Children are more at risk on major roads even when traffic density and speed are taken into account.
  ".... risk calculated in the same way for adults shows no difference in risk on major and minor roads.... lack of skill may be an important factor in the causation of child pedestrian accidents."

* Children run a greater risk when crossing near parked vehicles than when away from parked vehicles.
  "Surprisingly .... children are more at risk crossing away from road junctions than at road junctions." (Routledge, et.al. 1976(a), p.7B6-7).

Van der Molen (1981), in reviewing the literature relating to child road behaviour concludes that:

> "Children pay more attention to the road crossing task when crossing at junctions and at relatively high traffic intensities." (Van der Molen 1981, p.210).

TABLE 42 VARIATIONS IN PEDESTRIAN ACCIDENT RISK

Category	Accidents No.	Exposure %	Est. Relative Risk	
Age: 0-4	70	0.7	11.0 (H)	Males 15.02 (H) Females 7.71 (L)
5-10	184	5.4	3.72 (H)	Males 4.56 (H) Females 2.54(L)
11-20	153	18.2	0.92	Males 0.80 Females 1.10
			All Ages	Risk 0-10 Age
Alone	821	62.9	1.41 (H)	24.99 (H)
Accompanied	102	37.1	0.30 (L)	0.59 (L)
Running	254	14.8	2.14 (H)	11.67 (H)
Not Crossing (i.e. Playing)	44	12.9	0.36 (L)	6.98 (H)
Behind an object	70	25.0	0.33 (L)	5.63 (H)
TIME: 3-4 pm	85	8.6	1.06	12-3 pm 5.85 (H)
4-5 pm	131	8.9	1.58 (H)	3-5 pm 13.85 (H)
5-6 pm.	104	8.4	1.33(H)	5-7 pm 13.18 (H)
DAY: Friday	195	16.5	1.27 (H)	
Saturday	159	15.3	1.12	
Sunday	69	2.8	2.65 (H)	
Inter-sections	409	37.7	1.17 (H)	2.46 (L)
30 metres from intersection	383	32.7	1.26	14.61 (H)
9-30 metres from intersection	136	29.6	0.50 (L)	3.96 (H)
Zebra crossing 30 metres from	150	9.1	1.77 (H)	2.97 (L)
Zebra crossing 30 metres from	19	3.9	0.52 (L)	1.03 (L)
Zebra crossing	696	69.9	1.08 (H)	10.22 (H)
At traffic lights	-	-	-	0.48 (L)

Source: Cameron, Stanton, & Milne (1976) extract from Table 1 and 2 pages 1B4 and 1B5.

Reiss (1976), calculated school trip accident involvement rate for each age year between 5 and 14 years. He concluded that the youngest students were considerably over-represented in the school trip accident data and the oldest students under-represented. But this does not necessarily imply that the youngest pedestrians have the greatest exposure to vehicles as pedestrians. Routledge, et. al., (1974 a & b) studies reveal that exposure increases with age but risk and accident involvement decrease with age.

The major Australian study undertaken by Cameron, Stanton & Milne (1976) used accident data collected in 1971 and exposure measurements made in 1973. They defined exposure as the product of the number of vehicles and pedestrians observed at the same inter-section in five minute intervals, and the pedestrian accident risk as exposure divided by accidents, they developed risk ratings for various categories. A summary of their results appears in Table 42 (opposite).

Cameron and Milne (1978) found that the 5-10 age group accounted for nearly 90% of exposure in the under 11 age group. They found that, for the same pedestrian, the journey made to school (7-9 am) produced 60% more exposure than the after school journey (3-5 pm). This is because the journey is made at the same time as commuter traffic, but nearly five times as more accidents occur in the afternoon period, especially to younger males (est. risk 18.2). (See also Laugesen & Antoniadis (1984) who found, in New Zealand, that the journey home from school was five times more dangerous than the journey to school). The risk is not evident "in crossing" but "on road surface", i.e. playing or standing on road surface. Under 11 years of age crossing exposure, while running, was 25% and even higher (31%) for young males. This higher level of risk (5.63) is also evident when children crossed from behind an object, primarily a parked car.

Risk was lower when crossing at an inter-section or a pedestrian facility, but risk increased away from these facilities. It is possible that both children and drivers are more careful of their behaviour at an intersection or a pedestrian facility than on uncontrolled road sections.

Table 3. Percentage of fatalities and injuries by age and sex for different modes.

Characteristic	Fatalities and Injuries (%) Total Population (N = 5 369 000)	All Modes (N = 455 510 000)	Walking (N = 44 705 000)	Bicycle[a] or Mofa (N = 63 416 000)	Moped[a] or Motorcycle (N = 59 159 000)	Car (N = 270 248 000)
Age						
10-14	9.6	6.1	14.7	21.2	1.5	2.4
15-17	5.2	13.0	6.0	23.6	46.5	5.0
18-24	11.1	27.6	9.5	10.0	34.8	33.8
25-64	57.3	46.1	41.8	36.1	15.4	54.5
64 and older	16.8	7.2	28.0	9.1	1.7	4.3
Sex						
Male	47.1	66.0	49.0	NS	NS	61.7
Female	52.9	34.0	51.0	NS	NS	38.3

Note: NS = not shown in accident statistics.
[a]As driver or passenger.

Table 4. Accidents and amount of travel according to age and sex for all persons.

Characteristic	Total Population N	Total Population Percentage	Injuries and Fatalities N	Injuries and Fatalities Percentage	Avg No. of Trips per Day	Avg Travel Time per Day (min)	Avg Distance per Day (km)	Index[a] Trips	Index[a] Time	Index[a] Distance
Age										
10-14	51 284 000	9.6	27 885 000	6.1	2.35	48.6	14.1	97.1	89.8	62.0
15-17	28 168 000	5.2	59 143 000	13.0	2.66	60.1	17.0	109.9	111.0	74.6
18-24	59 699 000	11.1	125 890 000	27.6	2.73	63.0	24.5	112.8	116.4	107.8
25-64	307 690 000	57.3	209 873 000	46.1	2.61	58.0	27.1	107.9	107.2	119.0
64 and older	90 048 000	16.8	32 719 000	7.2	1.54	37.0	9.2	63.6	68.4	40.3
Sex										
Male	253 078 000	47.1	300 679 000	66.0	2.66	62.8	30.4	109.9	116.1	133.4
Female	283 812 000	52.9	154 831 000	34.0	2.21	46.1	15.8	91.3	85.2	69.5
Total	536 890 000		·455 510 000		2.42	54.1	22.8			

[a]For computation of index in the last three columns, the total average values of the previous three columns were made equal to 100.

Table 5. Accidents and amount of travel according to age and sex for persons walking and using bicycles and mofas.

Characteristic	Total Population (%) B	Total Population (%) C	Injuries and Fatalities (%) B	Injuries and Fatalities (%) C	Index Trips B	Index Trips C	Index Time B	Index Time C	Index Distance B	Index Distance C
Age										
10-14	9.6	9.6	14.7	21.2	114.9	322.5	116.5	262.9	116.8	241.4
15-17	5.2	5.2	6.0	23.6	108.1	334.8	126.2	340.0	127.1	389.7
18-24	11.1	11.1	9.5	10.0	75.7	100.0	82.3	105.7	83.2	119.0
25-64	57.3	57.3	41.8	36.1	97.3	73.9	92.7	68.6	94.4	69.0
64 and older	16.8	16.8	26.0	9.1	112.2	43.5	122.6	48.6	106.5	48.3
Sex										
Male	47.1	47.1	49.0	NS	79.7	NS	86.6	NS	88.8	NS
Female	52.9	52.9	51.0	NS	118.9	NS	112.2	NS	109.3	NS

Notes: B = persons walking; C = persons using bicycles and mofas.
NS = not shown in accident statistics.

Source: Brog & Kuffner (1982)

Although the risk/exposure of cyclists is not addressed, in the Cameron, et.al. studies, cycles are used by children primarily in the 7-17 age group for transport and recreation. The Geelong Bike Plan (1978) found that 63% of child cyclists were male. It seems reasonable to speculate that the higher degree of risk and exposure evident to young pedestrians would, in some way, carry over to young cyclists, especially males.

Wigan (1983b), using household interview data in Melbourne, produced measures of exposure of cyclists to risks on the road. He defined exposure as time spent riding a bicycle on the road. The study drew upon a larger Australian Road Research Board (ARRB) project which measured bicycle ownership in Adelaide, Brisbane, Canberra and the Gold Coast (Wigan 1982). Wigan's studies reveal that it is the 11-17 years age group who make the greatest use of bicycles. In Melbourne, 13% of this age group use a bicycle on any weekday, whilst in Adelaide it is almost one third. No sex data is supplied in the study. Wigan (1983b) concludes by recommending that a further study be carried out, on the relationship between accident rates and exposure.

The lack of relevant exposure data results in a lack of estimates of risk. For instance, it will be revealed in later sections that first year drivers are over-involved in road accidents with children 0-16. Accordingly, questions like the following need to be asked:

- are these drivers more exposed?
- are they more exposed at times when children are also exposed as pedestrians or cyclists?

Such questions require exposure data for an answer. It is significant that very few exposure studies have been carried out in Australia despite Henderson's plea, over ten years ago, in referring to 'The Data Gap':

> "The most important defect in the present system, however, is that there is no satisfactory ongoing index of EXPOSURE TO RISK, because without this index it is simply impossible to say with accuracy whether the traffic situation is changing, and if so, whether for the better or the worse." (Henderson, 1971, p.10).

One means of collecting exposure data is the 1976 KONTIV approach developed by Brog in the Federal Republic of Germany (See Brog & Kuffner 1982). This data (tables 43 and 44) relies on self-reported survey questionnaires. Since one of the basic premises of the technique is self reporting of one's own behaviour, the technique is not able to provide exposure data for children. Interesting, Routledge, et. al. (1974(a)) carried out interviews with children aged 5-11 years regarding every journey

Table 6. Accidents and amount of travel according to age and sex for persons using mopeds and motorcycles and using cars.

Characteristic	Total Population (%) D	Total Population (%) E	Injuries and Fatalities (%) D	Injuries and Fatalities (%) E	Index Trips D	Index Trips E	Index Time D	Index Time E	Index Distance D	Index Distance E
Age										
10-14	9.6	9.6	1.5	2.4	29.1	30.2	27.0	35.1	11.6	40.4
15-17	5.2	5.2	46.5	5.0	515.0	28.4	460.3	31.9	406.7	32.2
18-24	11.1	11.1	34.8	33.8	315.5	126.7	365.0	121.8	465.8	118.2
25-64	57.3	57.3	15.4	54.5	58.3	128.4	56.6	128.5	50.4	128.3
64 and older	16.8	16.8	1.7	4.3	34.5	31.0	32.6	31.9	21.8	27.7
Sex										
Male	47.1	47.1	NS	61.7	NS	132.8	NS	139.7	NS	140.5
Female	52.9	52.9	NS	38.3	NS	69.0	NS	64.2	NS	61.8

Notes: D = persons using mopeds and motorcycles; E = persons using cars.
NS = not shown in accident statistics.

Table 7. Accident rates according to age and sex for all persons, persons walking, and persons using bicycles and mofas.

Characteristic	Index Value for Injuries and Fatalities: Per Inhabitant A	Per Inhabitant B	Per Inhabitant C	Per Number of Trips A	Per Number of Trips B	Per Number of Trips C	Per Distance Traveled A	Per Distance Traveled B	Per Distance Traveled C	Per Time Spent Traveling A	Per Time Spent Traveling B	Per Time Spent Traveling C
Age												
10-14	64.1	153.8	222.1	66.0	133.9	68.9	103.4	131.7	92.0	71.4	132.0	84.5
15-17	247.3	114.5	450.2	225.0	105.9	134.5	331.5	90.1	115.5	222.8	90.7	132.4
18-24	248.5	85.1	89.7	220.3	112.4	89.7	230.5	102.3	75.4	213.4	103.4	85.0
25-64	80.4	73.0	63.0	74.5	75.0	85.3	67.6	77.3	91.3	75.0	78.8	91.8
64 and older	42.8	167.0	54.1	67.3	148.8	124.4	105.7	156.8	112.0	62.6	136.2	111.3
Sex												
Male	140.8	103.9	NS	128.1	130.4	NS	105.6	117.0	NS	121.3	120.0	NS
Female	64.3	96.5	NS	70.4	81.2	NS	92.5	88.3	NS	75.5	86.0	NS

Notes: Index values for A, all persons; B, persons walking; C, persons using bicycles and mofas. For the computation of the indices, the average value of the given accident rate was made equal to 100.
NS = not shown in accident statistics.

Table 8. Accident rates according to age and sex for all persons, persons using mopeds and motorcycles, and persons using cars.

Characteristic	Index Value for Injuries and Fatalities: Per Inhabitant A	Per Inhabitant D	Per Inhabitant E	Per Number of Trips A	Per Number of Trips D	Per Number of Trips E	Per Distance Traveled A	Per Distance Traveled D	Per Distance Traveled E	Per Time Spent Traveling A	Per Time Spent Traveling D	Per Time Spent Traveling E
Age												
10-14	64.1	15.7	24.8	66.0	54.0	82.1	103.4	135.3	61.4	71.4	58.2	70.7
15-17	247.3	886.1	94.3	225.0	172.1	332.0	331.5	217.9	290.9	222.8	192.5	295.6
18-24	248.5	313.2	304.1	220.3	99.3	240.0	230.5	67.2	257.3	213.4	85.8	249.7
25-64	80.4	26.9	95.1	74.5	40.1	74.1	67.6	53.4	74.1	75.0	48.4	74.0
64 and older	42.8	10.2	25.9	67.3	29.6	83.6	105.7	46.8	93.5	62.6	31.3	81.2
Sex												
Male	140.8	NS	130.6	128.1	NS	96.5	105.6	NS	93.1	121.3	NS	93.6
Female	64.3	NS	72.5	70.4	NS	105.1	92.5	NS	117.3	75.5	NS	112.9

Notes: Index values for A, all persons; D, persons using mopeds and motorcycles; E, persons using cars. For the computation of the indices, the average value of the given accident rate was made equal to 100.
NS = not shown in accident statistics.

Source: Brog & Kuffner (1982)

made during the previous 24 hours. Routledge, et. al. (1976(a)) concluded that children's self reports were more accurate than mothers reports supporting Brog's insistence on self reporting.

Brog and Kuffner (1982) present accident rates based on the KONTIV 1976 data. Their data serves to demonstrate that entirely different conclusions of accident data will emerge from analysis of risk/exposure data to that obtained by raw accident data. In the tables supplied by Brog and Kuffner the discrepancy between accident statistics and behavioural data is very significant: e.g., 62% of all car passengers injured or killed are men but when accident rates are based on total travel exposure in cars, the accident rate is lower for men than for women.

Since it is the only data of its kind, the Brog & Kuffner tables have been included in full in tables 43 and 44. Some of the more salient observations from the data appear to be:

* Younger (and older) pedestrians run an average risk of having an accident (younger 153.8 index) but this risk is relativised when the number of young people walking is taken into consideration. The 18-24 age group, who are least likely to walk, have an above-average risk of having an accident whilst walking. (Table 44/7).

* Children 10-14 years who use bicycles are more than twice as likely as most other age groups to have an accident but they use their bikes more than most other age groups. (Table 44/7).

* Children 15-17 who use bicycles are twice as likely as the 10-14 year olds to have an accident and over 4 times more likely than other age groups, but they are the heaviest users of bicycles. The 15-17 year olds do have the greatest risk of an accident. (Table 44/7).

* The second most at risk bicycle group is the over 64 age group who appear to have a low accident rate. However, because they use bicycles so rarely their risk factor is second only to the 15-17 age group. (Table 44/7).

* The 15-24 age group have a high risk of motorcycle accidents but they also use these modes the most frequently. Thus the actual risk for the 15-24 age group is not as great as it appears. (Table 44/8).

* For persons using cars it is not the 18-24 year olds who are more at risk it is the 15-17 year olds. (Table 44/8).

Jonah & Engel (1983), report an exposure study for the autumn of 1979-80 in the regional municipality of Ottawa-Carleton (Canada).

Their exposure data reveals that adolescents and adults engage in more pedestrian activity than children and the elderly. The relative risk data, using population as the exposure index, indicates that the relative risk is highest for adults 18-24. However, if accident risk rates are computed it is the children (3-12) and the elderly who have the highest accident risk rates and who are more clearly at risk.

Jonah & Engel calculated relative risk accident ratios using population, number of trips, distance, duration, and number of streets crossed as their measures of exposure. They found adults 18-24 had the highest risk ratio using 'population' as an exposure index and the 25-44 age group the lowest. Using 'trips' as the exposure index, the elderly had had the highest risk ratio followed by children 3-12. Using those exposure indices which reflect actual exposure to risk ('distance', 'duration', 'crossings') the children aged 8-12 had the highest risk ratio followed by children 3-7 and the elderly.

Howarth & Lightburn (1980) report a study of exposure and risk on journeys home from school. They found that risk estimates based on interactions do not show the sex differences that are so apparent in the risk estimates based on accidents. They conclude:

> "This suggests that the greater risk of an accident to boys compared with girls is not due to greater caution on the part of girls. On the contrary it suggests that boys and girls are involved in a similar number of difficult situations, but that the girls are somehow more competent in extricating themselves from the situation. Similarly, older children may deal with interactions more competently than younger children. (Howarth & Lightburn 1980, p.365).

2.6 Nature of Injuries

Australian road accident data is usually available in terms of deaths, hospitalised, and treated injured. In the tables in section 2.1 and 2.2, it was established that similar patterns exist whether the data being analysed is road "death" statistics or road "injury" statistics. Accordingly, in the research reported in later sections of this volume an assumption is made that there is little or no differences in the circumstances surrounding a fatal versus a non-fatal reportable accident and that the differences lie largely in the speed of the vehicle or idiosyncratic chance circumstances relating to the particular accident.

Ashton, Hayes, & Mackay (1974) from the University of Birmingham, in their report on child pedestrian injuries, stated that:

> "Children seem to sustain less severe injuries than adults of comparable impact speed, when considering injuries from the front of the vehicle, but there appears to be no difference in the severity of injuries sustained from contact with the road." (Ashton, et.al., 1974, p.161).

They found that head and face injuries occurred in 29% of cases for children, and 38% for adults, while 32% of both children and adults received leg injuries. When considering serious injuries, 60% of children suffered serious head and face injuries, compared with 36% for adults. Serious leg injuries, for children occurred in 17% of cases, and for adults in 31% of cases.

Ashton (1982) concluded that about 95% of all pedestrian accidents occurred at less than 50 km/hr, and about half at 20-25 km/hr. At the lower speed, injuries are less serious but, at speeds in excess of 55 km/hr death usually occurs, and at around 30-35 km/hr injuries become 'serious'. Blair (1969) had earlier indicated that the majority of young children are killed or injured close to their home on relatively low speed streets.

Factors, other than speed of the vehicle, will affect the severity of the injury. One major factor is the point of impact. Younger children are more likely to sustain serious and fatal injuries when struck by the front of the car, especially the side-front, which is reinforced to reduce damage from motor vehicle to motor vehicle collisions.

At lower speeds, the pedestrian would be hit by the leading edge of the bumper bar and the front edge of the bonnet, before impact with the ground. At higher speeds, the pedestrian is often thrown onto the bonnet, and can have impact with the windscreen, before being thrown to the ground. This usually results in multiple injuries caused by the impact with the motor vehicle and the road surface, and this is more likely to lead to death.

At the higher speeds, younger children are more likely to be 'run over' by the motor vehicle, as the centre of impact is located in the head and chest region. Ashton (1982) points out that the ideal bumper bar height would be 35 cm from the ground, which lowers the centre of gravity in a child to hip height.

Most pedestrian accidents with children occur in residential streets, where the speed limit is lower but, according to Jarvis (1983), the Australian accident severity rate (killed as proportion of all casualties, in 1976 for pedestrians was 7.0 in the 0-6 age group, and 2.8 in the 7-16 age group. Jarvis suggests this could be a function of the alertness and agility of this older age group, which would be a function of the increased psycho-motor development occurring during these years.

Lee (1981) pointed out that cycle accidents to children mainly constituted cuts/abrasions/grazes (46.3%), with fractures (24.1%) and concussions (10.4%) occurring next. Head injuries (19.5%) and facial injuries (13.7%) comprised a total of 33.2% of injuries, while injuries to upper limbs (arms) was 25.4%, and lower limbs (legs) 21.2%.

Blicaves & Savage (1973) found that, in a cycle/motor vehicle collision, the least injured parts of the body were the upper limbs, head and neck lacerations, while in a cycle accident (i.e., cyclist alone) upper limbs were the most seriously injured. They concluded that the force of the motor vehicle collision throws the cyclist to the ground, resulting in upper body injuries and leg injuries, where the limb was caught by the impact of the car. The cyclist alone data displays a higher proportion of falling types of accidents, where the cyclist has time to use his arm to break the fall.

The accident severity rate for cyclists (Jarvis 1983) shows a rate of 2.9 for both the 0-6 and 7-16 age groups, which is very similar to the passenger rates (2.6 and 2.8 for the respective age groups).

Blicaves & Savage's (1973) study also showed that the most common injuries to child passengers were concussion, head and neck lacerations, fractured facial bones, with the least injuries to legs and arms. Most of the injuries resulted in the head striking objects in the car, as the child was not restrained. Being an unrestrained passenger in the front seat produces more serious injuries than being unrestrained in the back seat.

Bicycle "Helmets" have recently been promoted in some Australian states in the belief that most pedal cyclist deaths are due to head injuries. The importance of head injuries was referred to by McDermott and Klug in the Medical Journal of Australia (1982).

The importance of wearing safety helmets has most recently been emphasised by McDermott (1984). The value and importance of pedal cyclists wearing safety helmets has not always been beyond question. Dorsch, Woodward & Somers (1984) recently carried out a field analysis, as distinct from previously reported laboratory tests. Their study revealed a statistically significant association between helmet usage and reduced severity of head injury. They estimated the risk of death from head injury to be from 4 to 19 times greater for unhelmeted relative to helmeted pedal cyclists, depending on helmet type.

Lugg (1982) found that 50% of bicycle accident cases admitted to hospital in Perth (W.A.) involved head injuries. Trinca, (1983 & 1984) cites almost 70% of pedal cyclists admitted to two community hospitals in Melbourne (Vic.) as having head/neck injuries.

3.0 EXISTING KNOWLEDGE IN RELATION TO ACCIDENT ENVIRONMENT

Chapter three attempts to examine the published literature with respect to major environmental influences on road crashes involving children. The literature search covers the local scene, in detail, and is supported by relevant overseas material. The factors of 'time' and 'place' are covered in some detail with particular emphasis on 'location' factors. Since a high proportion of road accidents involving children as casualties involve crashes with vehicles, this chapter examines driver-related factors. A brief summary of key environmental factors concludes the chapter.

3.1 Time Factors

Time factors vary to some degree between different countries, possibly due to different climatic conditions. Ekstrom, Gastren & Quirst (1966) found that, between 1953 and 1962 in Sweden, 47% of traffic accidents to children occurred between 2-6 p.m. The Skandia Report I, 1971, (Swedish) also found that half of the accidents occurred between 2-5 p.m., between Monday and Friday, peaking on Friday, with the fewest on Sunday, followed by Saturday. Pedestrian accidents were distributed across the year, with an increase between May and October (Summer) and peaking in May and August, with the lowest in January. Cycle accidents mainly occurred between May and September, peaking in August.

In the United Kingdom, the time peaks are 8 a.m./noon/4-6 p.m. for weekdays (slight increase Friday). Weekends show a more even distribution, with a slight peak in the afternoon, and an increase in November and a decrease in July (Wade, Foote & Chapman, 1982).

Bennett & Marland (1978) found that, generally, more than one-fifth of accidents in the United Kingdom occurred between 4-5 p.m. and that only half were coming home from school. Overall, only 35% of children in accidents were going home. Children under 10 were more at risk during Summer than Winter.

Jarvis (1978) showed a similar pattern in Australia. Both pedestrians and cyclists are more at risk after school, with the older child being at risk during later times. During the week, the hours after school until 5 p.m. are the worst times, with a peak on Fridays. Saturday has a minor peak between 9-10 a.m., and a major peak around 6 p.m. Sundays have a minor peak at 8 a.m. and 11 a.m., and major peak at 3-4 p.m.

Lee (1981), from the Royal Alexandra Hospital for Children, in an analysis of 290 hospital cases (country and urban), found that weekends accounted for 56% of cycle accidents. Of these weekend accidents, 64% occurred between 1-6 p.m. and 22% between 4-5 p.m. Bicycle accidents occurring between 7-8 p.m. mainly involved children in the 10-13 age group. More recently, The Child Safety Centre (1984) at the Royal Alexandra Hospital for Children found that of the 259 children treated for bicycle accidents in calendar 1983, Sunday was the most popular day for accidents (25%) whilst the weekend accounted for 47% of accidents. Considerably more accidents (29%) occurred between 4 and 6 p.m.

Cameron (1984), in analysing 1981 pedestrian accidents for the Melbourne Statistical District, found that most child pedestrian accidents occur during daylight - 0-4 (91%); 5-11 93%; 12-16 73% compared with the 17-60 age group which averaged under 60% in daylight. The over 60 age group had 68% of accidents in daylight.

3.2 Location Factors

An exposure study aimed at measuring the relative risk of pedestrian accidents was carried out in Canada by Jonah & Engel (1983). They reiterated the previously well-known fact that dart-out accidents were the most common form of accident to pedestrians, followed by intersection and mid-block dashes. Most victims were male, between 3-12 years of age, and they occurred in urban areas between 3.00 p.m. and 6.00 p.m.

The characteristics of each age group were as follows: 3-7 years, between 3-6 p.m., on their way home from school, they were accompanied by someone (not necessarily an adult). The accidents occurred at an uncontrolled intersection; two-thirds in residential streets. The 8-12 age group accidents occurred between 3-6 p.m., either from school, at a transport centre, or social area; 50% were accompanied, more than 80% occurred at uncontrolled mid-block or intersection, and 80% in residential streets. The 13-17 age group were similar to the 8-12 group, but the older children made more trips downtown, on main roads, and made more crossings at intersections, with or without traffic lights.

The Skandia Report (Sandels, 1971) found that, in most child pedestrian accidents, the child was accompanied mainly by peers and that almost half of the time the friend remained on the pavement, while the victim went out on to the road. In 15 of the 35 cases, the same patterns existed although the child was accompanied by an adult, who usually had no physical control over the child.

Bennett (1979) pointed out that, in the United Kingdom, the more local the road, the more likely an injury to a child will occur on it. He reported that 84% of injuries to under 10 year olds happened within 800 m of home, and 44% in their own street. This substantiated what Preston (1972) had found, that for under 5 year olds, most accidents (59%) occurred within 100 yards of home, often outside the front door. For the 5-10 age group, 52% of accidents occurred within a quarter of a mile from home. Most accidents to the 0-10 age group occurred on minor residential roads and, in most instances, the child was unaccompanied by an adult (92% for the 0-5 age group).

The "Tasmania Transport" Study (1983) found that, in 1981, of the 58 accidents to the 6-16 age group, 35 occurred going to and from school; 10 occurred in the same street as the child lived, 14 in the same suburb, and 24 on priority type roads. All fatalities (9) occurred on busy roads, 5 outside school hours, 4 fatalities were 'dart outs', and 2 were behind a school bus. In the case of injuries, 13 ran out onto the road, and 6 ran out from behind a stationary bus. The same study which covered 1977-1981, showed that:

- the under 12 age group accounted for 12.4% of fatalities;
- the 12-20 age group accounted for 12.5% of fatalities;
- the under 16 age group accounted for 43% of accidents.

A detailed breakdown of South Australian pedestrian accident data for 1974-76 shows that the most dangerous behaviour is crossing a road which is not controlled, in either an active or passive manner.

TABLE 45

Pedestrian Killed & Injured While Undertaking Activity Shown, South Australia 1974-76

Activity	% Killed	% Injured
Walking along footpath	2.6	4.2
On pedestrian crossing	0.6	5.4
Within 30 m of crossing	2.9	1.8
Alighting from parked vehicle	1.7	1.2
Walking from behind vehicle	4.1	12.2
Walking along roadway	2.9	4.9
Pushing or walking a vehicle	1.7	1.6
Playing on roadway	1.8	2.4
Crossing without control	71.3	56.9
Crossing with signal control	9.9	7.6
Other	0.0	1.8

Source: Jarvis (1983), p.31 table 2.8

Ryan (1968), using cycle accident data from South Australia for 1963-65, showed that, in 90% of cycle accidents to under 15 year olds, the cyclist changed direction. This reduced to less than one-third for the over 15 age group.

The Geelong Bike Plan (1980) reported that 41% of cycle accidents involved right angle collisions, usually at an intersection, 24% were struck from behind whilst engaging in unpredictable behaviour, 60% at an intersection; and 53% on residential street intersections.

Table 46 analyses bicycle casualties/accidents by location and age, for 1975, was derived by Jarvis from The Geelong Bike Plan Data. Jarvis found that eighty percent of bicycle accidents to children under 6 years of age occur on residential roads; 47% of the 7-11 age group, and 43% of the 12-17 age group also occur on residential roads. Main road intersections are six times more dangerous than residential intersections, and main road mid-blocks are only 2 1/2 times as dangerous as their residential counterpart.

TABLE 46

BICYCLE CASUALTY ACCIDENTS BY LOCATIONS AND AGE
MELBOURNE STATISTICAL DIVISION 1975

	Type of Road		
	Arterial	Sub-Arterial	Residential
		Intersection	
under 6	1	0	1
7-11	18	14	23
12-17	57	32	28
over 17	50	15	6
		Mid-Block	
under 6	1	0	6
7-11	12	6	22
12-17	22	28	15
over 17	20	6	3

Source: Jarvis (1983) p.33 Table 2.9

Brindle & Andreassend (1984) analysed 1981 reported bicycle accidents in Melbourne in terms of road hierarchy in order to assess the importance of road types on bicycle accidents. They found that, up to the age of 12, children were involved in reported accidents more frequently within residential localities than on main roads which surround these localities. Further, they suggest, because over half of the cyclists involved in accidents on collector and local streets are under 13 years of age, that the traffic environment on those streets is not safe for young pedal cyclists. There is also a suggestion in the Brindle & Andreassend study that analysis of computer mass data accident records may understate the importance of local streets because the accident may be assigned incorrectly to priority roads and thus actual accident records need to be studied. Additionally, they argue for better reporting on street 'type'.

Barson (1977) indicates that Victorian and American statistics show that mid-block cycle accidents account for 60% of cyclist injuries and deaths; and 60% of mid-block accidents occur on major roads. Many mid-block accidents result from cyclists positioning themselves upon the road to make a turn at an intersection that they are approaching. According to Barson (1977), who cites a study by Robertson et. al. (1966), the manoeuvres which cyclists find difficult or dangerous are usually associated with intersections either turning right from left to centre lane or travelling across an intersection in the left hand lane.

Travel to and from school is believed by some; e.g., Barson (1977) to be significant in child road accident and deaths as pedestrians or cyclists. Barson cites the number of accidents occurring for 5-16 year olds between 7-9 a.m., 12.30 - 1.30 and 3-5 pm on days of year school was in session over 1971-73 for South Australia but such data is hardly convincing. Barson also cites a 1961 study by Hawley for Victoria which purports to support the importance of school. Certainly, a disproportionate number of accidents to 7-12 year olds occurred between 8 and 9 a.m. and between 4 and 5 pm but it is conceivable the 4-5 pm accidents occur after a journey home from school; i.e. after going home or to someone else's home or some other venue.

The most recent and extensive review of pedestrian accidents (Wade, Foote & Chapman, 1982) indicates that analysis of 1978 British pedestrian accidents for weekdays shows three peaks for child pedestrians - 8 a.m., 12 noon, 4 p.m.; and for adults - 8 a.m., 12 noon, 4 p.m. on Fridays and 5 p.m. on Mondays. They cite a study by Grayson (1975a) in Hampshire which suggests that the alleged hazards of the evening school-to-home journey were not an important factor. Grayson found that journey to and from school accounted for similar proportions of accidents; also, only 35% of school-aged children injured between 4-5 p.m. were coming home from school, and only half the children injured were going home between 4-5 p.m. They conclude:

> "Thus, it seems that a substantial proportion of child pedestrian accidents during the late afternoon of weekdays occur as a result of journeys other than those undertaken for the purpose of going to and from school: that is, those associated with playing, running errands and visiting." (Wade, et. al., 1982, p.239).

Pedestrian accidents for all ages appear to be predominantly a metropolitan problem. In 1981, 83% of pedestrian casualty accidents (all ages) in Victoria occurred in the Melbourne Statistical Division. A similar pattern existed in 1977, in Victoria, as shown in table 47.

TABLE 47

VICTORIA PEDESTRIAN ACCIDENTS 1977

Age of Pedestrian	Melbourne	Rest of Victoria	Total Victoria
0-4	163	63	226
5-11	372	115	487
12-16	181	57	238
0-16	716	235	951

Source: Wood (1979) DERIVED FROM TABLES.

Smeed (1976) pointed out that the risk of a pedestrian becoming a pedestrian casualty increases with population density, the rate of increase being greater for serious than for fatal casualties and greater for slight than serious ones.

Cameron (1984) points out that, whilst children under 17 are involved on all road types including minor roads and account for 30% of accidents on arterial roads, it is the adults and the elderly who are more involved on arterial roads and account for 70% of the accidents.

The following table, derived from Cameron (1984), reveals that a large proportion of child pedestrian accidents do not occur on major roads.

TABLE 48

VICTORIAN PEDESTRIAN ACCIDENTS 1977
MELBOURNE STATISTICAL DISTRICT

	0-4	5-11	12-16
	%	%	%
Arterial	32	48	80
1975 Statcom	18	22	11
1977 Statcom	10	11	3
Other	40	20	6
Total	100%	100%	100%

Source: Cameron (1984) (p.20)

Cameron's (1984) analysis of 1982 pedestrian accident data for the Melbourne Statistical District reveals that, whilst 70% of all pedestrian accidents occur mid-block with no traffic control, for the 5-11 age group and for the 0-16 age group it was 77%.

Andreassend, Hoque & Young (1984) analysed 1981 metro Melbourne pedestrian accidents and found 47% of the pedestrians involved in local streets were under 9 years of age whereas adults predominated on arterial roads.

Jamieson, et. al. (1981) also point out that the problem of pedestrian crashes is predominantly an urban one, with about three quarters of N.S.W. pedestrian crashes occurring in the Sydney Metropolitan area. Using exposure data they demonstrated the relative pedestrian risk was considerably higher on local streets than on collector roads or arterial routes.

The evidence, thus far, strongly suggests the contention that a high proportion of child pedestrian and bicycle accidents occur in residential or neighbourhood streets. Additional supportive evidence is supplied by Snyder et. al. (1971) in a study of U.S. pedestrian accidents where 72% occurred in residential areas and they generally did not involve high speeds.

Barson (1977) states that 60% of fatal pedestrian accidents in the metropolitan area involve vehicles travelling at speeds within legal limits. Accordingly, there may be a need to further inhibit or control speed in residential areas. Earlier, Vaughan (1972) related pedestrian fatalities to impact speed (estimated) and found that

- 30% occurred at under 25 m.p.h. (40 kph)
- 33% " " 26-30 m.p.h. (41-45 kph)
- 27% " " 31-35 m.p.h. (49-56 kph)
- 10% " " 36 m.p.h. or excess. (57 kph).

Brindle (1978) argued that minor streets were important since a third of all pedestrian casualties occur there. Camkin (1978) reported that 55% of N.S.W. pedestrian casualties occurred on 'local roads' and half of these were residential streets. Bennett (1979) claimed that traffic engineers have traditionally trivialised residential area streets. Brindle (1982) argues that the key to creating safer streets in new and old urban areas lies in reducing vehicle speeds. Brindle suggests that what is needed is the creation of an environment of care in residential streets. The measures to achieve this environment are widely known to the engineers. In addition to creating scaled-down or restrained roadways to reduce speed Brindle (1982) argues for consideration of the "Woonerf" where pedestrians are free to move at will and children may play in safety, whilst those vehicles having a genuine need of access may enter provided they respect the freedom of those on foot. Brindle argues that cul-de-sacs have good safety records because their length generally means that cars are constrained by proximity to stop or turn conditions, and by any neighbourhood consideration that may apply. It is these same conditions that streets within a woonerven take on. Brindle claims, therefore, that physical design in existing streets can play an influential role in increasing safety. A view supported by Stapleton's (1983) studies for the N.S.W. Land Commission.

In theory, neighbourhood streets ought to be relatively low speed roads. Brindle (1982) points out that Australian Road Research Board (ARRB) is currently investigating the relationship between physical characteristics of the road and the distribution of speeds on it. He also indicates that more ought to be known about the correlation between these parameters and accident rates:

> "The writer maintains that overseas evidence and practice on this subject cannot be ignored. The evidence points overwhelmingly to one common theme (OECD, 1979):
>
> > 'There is general agreement that speed should be limited to residential streets and that speed reduction should be obtained by physical measures built into the streets rather than by regulations'." Brindle (1982) p.50.

The evidence is strong that most child accidents occur in residential streets with a 60 kph speed limit. Further, many accidents may occur over this limit since the incidence of driving over this limit could be quite high. If the actual speeds were reduced the incidence and severity of child crashes could also be reduced. The way to reduce actual speeds is not by legislation or regulation (speed signs) but by physical measures.

It seems a reasonable hypothesis that motorists, in general, are more "ready" or "attuned" to be on the watch at intersections for cars, bikes, pedestrians. Bishop and Harwood (1978) found that 68% of school-aged-pedestrian accidents which occurred on non-main roads occurred away from an intersection. The Geelong Bike Plan (1978) similarly reports the importance of mid-block as opposed to intersections, especially for the younger child. Thus slowing down vehicles mid block appears to be a worthwhile consideration in residential streets.

Brindle (1978) points out that the data on vehicle speed and accident rate is sparse. Like the current author he feels that:

> "It seems reasonable to assume that, all other things being equal, a street carrying faster vehicles will tend to be more dangerous to pedestrians." (Brindle 1978, p.11-12).

Brindle (1978) cites a study by Sumner & Baguley (1978) where a marked drop in speeds, due to speed control bumps, on a street in Oxford (UK) corresponded to a dramatic drop in casualties. Of course, correlation is not causation.

3.3 Driver Factors

Drivers represent a vital part of the accident environment. Most fatalities and serious bicycle and pedestrian accidents involving vehicle occupants, especially with teenagers, warrants some attention being drawn to driver factors.

Sandels, in the Skandia Report (1971) points out that, in nearly 50% of pedestrian accident cases, drivers with free vision, involved in child pedestrian crossing accidents, saw the child when he/she was on the road. Most drivers who saw the child stopped, did not compute the behaviour, or thought the child would stay where he/she was. Sandels described the behaviour of the drivers at marked pedestrian crossings in a large number of cases as "astoundingly ruthless", with little consideration of the child's rights.

In the second Skandia Report, Sandels (1974), points out that drivers over-estimated the child's abilities and drove in a manner which frightened the child; i.e., changing lanes, no signalling or late signalling, or not slowing down. The same behaviour is exhibited by drivers towards cyclists, where they do not consider the rights and abilities of the cyclist. For both groups, drivers do not seem to consider the fact that children often travel in groups.

With regard to pedestrian accidents, in particular, drivers are usually not seen to be at fault. Snyder and Knoblauch's (1971) post hoc analysis of over 2,000 pedestrian accidents in 13 U.S. cities in 1969-1970 lead Brown (1980) to conclude:

> "1. It is seldom that any pedestrian accident has a single cause....
> 2. The more frequently identified factors are those which ascribe causation to the pedestrian's behaviour.
> 3. Marginally the most frequent factor in causation was the pedestrian's poor choice of a place or time to cross the road.
> 4. Of almost equal importance ..... was the pedestrians failure to search and detect the on coming vehicle.
> 5. <u>The driver's failure to search and detect the crossing pedestrian was a prime factor in his accident involvement.</u>" Brown (1980, p.138).

Humphreys & Sobey (1978) also tend to ascribe much of the causation to the pedestrian as a result of the on-scene studies carried out in Sydney N.S.W. They too endorse the multiple causation theory and suggest a distinction between (a) main contributing factors, (b) aggravating factors and (c) uncertain contributing factors. With respect to main contributing factors they found

> "The results indicated that nearly all the (a) factors were behaviourally oriented and that more of these factors were attributed to pedestrians themselves than to the drivers/riders who collided with them." (Humphreys & Sobey 1978, Summary).

McLean (1978) in the Adelaide in-depth accident study also points out, in his analysis of mid-block accidents for the 9 of the 35 involved children who ran out on to the road, that:

> "In most of these accidents there was very little that the driver could have done to have avoided hitting the child, particularly in those cases in which a child ran from behind a parked vehicle." (McLean 1978, p.4).

McLean suggests that the requirement that a motorist <u>should</u> keep to the left on a multi-lane road may increase the risk of a collision with a child pedestrian. The recent move in N.S.W. to consider mandating that motorists must keep left or else be served a traffic infringement notice could well prove to be counter productive as far as child pedestrian accidents are concerned.

Kenchington, Alderson & Whiting (1977), in their analysis of 276 child pedestrian accidents resulting in slight injuries in Wakefield and Leeds in 1972, found that 60% of accidents were characterised by the possibility of inattention on the victim's part; and, that in 70% of accidents the child was held responsible for the accident.

Barson's (1977) review on the safety of children on Australian roads, concludes that drivers doing 60 km/hr, or greater, will not generally stop to let a pedestrian across the road. Sheehy (1982) reveals that numerous factors influence a driver's stopping behaviour include time of day, width of road, traffic and speed signs, and their tolerance to pedestrians, including the pedestrian characteristics (such as model effects, sex and attractiveness, and length of delay). Zuercher's (1976) research suggests that drivers are very reluctant to give way to pedestrians who seem likely to cause them above average delays. Both Barson's and Zuercher's research lend added weight to Brindle's argument that safer streets will require a reduction in vehicle speeds.

Child pedestrians are more likely than the driver to take evasive action to avoid a collision (Howarth & Lightburn, 1980). About 33% of drivers brake but only 2% alter course. If the pedestrian is crossing the road, the driver may slow down only if he cannot make some other manoeuvre or the gap is too small. The authors concluded that drivers do not seem to think ahead to allow enough time to stop.

Howard & Repetto-Wright (1978) argue that the plea, 'The Child ran heedlessly into the road and there was nothing I could do to prevent the accident' is a cultural stereotype rather than a genuine description of what actually happens. Howarth & Lightburn (1980) claim that their studies:

> ".... provide the first concrete evidence of what actually happens when vehicles and pedestrians interact. They confirm our expectations to a disturbing degree. The most important observation is that no driver has been seen to anticipate an accident with a child until it is almost certainly too late for him to prevent it." (Howarth & Lightburn, 1980, p.370).

Howard & Lightburn studies involved 1,100 interactions in the City and Nottingham. Their evidence shows that once the interaction has developed:

> "..... it is the pedestrian who is the more likely to take some form of avoiding action such as stopping or accelerating out of the vehicle's path. But before the interaction occurs, the difference is even more marked. Clearly, distant anticipation of potential accidents is being shown by pedestrians rather than drivers. It is of course true that pedestrians can stop in a shorter distance than is required by the faster moving car. One may speculate that drivers use this as an excuse for putting almost all the responsibility for distant anticipation on to the pedestrian. Logically (and humanely) it should be the other way round. The car's longer stopping distance should cause the driver to take relatively more responsibility for distant anticipation. Drivers are frequently exhorted to think ahead by at least the distance it takes to stop the vehicle at the speed they are travelling. We can find no evidence that they do so.
>
> "In the circumstances, it is ironic that it is usually the child who is considered heedless and irresponsible whenever an accident occurs. Our evidence suggests that it is more likely that the driver is the irresponsible one, since it is extremely unlikely that accidents occur only to the very small proportion of drivers who anticipate them." (Howarth & Lightburn, 1980, p.367).

The Geelong Bike Plan Study (1978) found that cyclists below the age of 17 "initiated" 75% of the accidents they were involved in.

Shinar (1978), by adapting of the findings of the study by Snyder & Knoblauch (1971), suggest that the driver's contribution to accident statistics is clearly one of visual search and detection of crossing pedestrians, rather than faulty driver actions or evaluations. According to Brown (1982)

> "...the typical behavioural mismatch occurs when a pedestrian crosses in the 'wrong' place, or at the 'wrong time', without looking out for on coming traffic and then collides with a driver who sees the pedestrian too late to take effective avoiding action." (Brown 1982, p.138-139).

The question of whether or not drivers see the pedestrian is a difficult one. Little data seems to exist other than Sandels (1971) study of pedestrian crossings. The Shinar (1978) study suggests that drivers do see pedestrians but too late to take action. But are most pedestrian accidents unavoidable dart-outs?

Brown argues that the real question is 'why' do the driver's search and detection processes so commonly fail to provide sufficient advance information. According to Brown

> "....the potential hazard presented by pedestrians is well-known by most drivers and traffic rules and conventions oblige them to travel at a speed which allows them to stop safely 'within the limits of visibility'. Clearly many drivers are not complying with this basic requirement of road safety." (Brown 1982, p.139).

Earlier, Brown (1980) suggested that drivers adjust their speeds according to both their expectations of hazards and their perceptions of hazards. Drivers expect hazards at intersections and this may help explain the finding that children are more at risk crossing away from intersections than at intersections (Routledge et.al. (1974); Sandels Skandia Report II (1974), p.12; SWOV (1977), p.12. Drivers expect children to cross at intersections and may behave more cautiously at intersections than they do mid-block.

The importance of driver expectation may also help to explain why contrary to Barson (1977) child pedestrian accidents seem to peak at 5-6 p.m. rather than during the periods when children are going to and from school (Kruse and Nielson (1980); S.W.O.V. (1977). Is this a function of exposure or is it due to driver's greater expectancy of young pedestrians crossing the road just before or after school?

Brown (1980) suggests that much more research is needed into the driver's difficulty in perceiving and interpreting child pedestrians' pre-crossing behaviour especially with young drivers. Older and Grayson (1974) identified this as a major area ten years ago, but little seems to have emerged to date.

Children are no doubt a problem, but young drivers are an even greater problem. Adults too are a problem. Camiller (1983), in defense of the Essendon Traffic School, pointed out:

> "In my own evaluation of adult performance on Victorian roads and at the traffic school, my observations indicate the following statistics:
>
> Over 90% of drivers do not stop at STOP signs if there is no need to give way.
> Almost 90% of drivers continue over stop lines at traffic lights.
> Almost 80% of adults disobey amber traffic lights as drivers and pedestrians.
> Almost 95% of adults fail to look properly before crossing at traffic lights.
> The majority of adults 'take' right-of-way rather than 'accept' it.
> Almost all adults fail to teach their children safe road use correctly.
>
> Our problems therefore are enormous. The problems are adults. Adults are apathetic. Adults are unaware of their ignorances. Adults perpetrate the dangers, set the standards and blame others. They teach our children. Adults are the cause of road trauma! Yet adults in general are loving, caring well intentioned parents and teachers. The problem is not insurmountable if we see it in perspective and are willing to accept the challenge." (Camiller, 1983).

Camiller argues that trying to educate the young 17 year old driver <u>is all too late</u>, since from childhood he or she has been exposed to adults modelling the very behaviour authorities are seeking to eradicate.

Henderson (1971), pointed out that the teenage driver is not only learning to manage his car he is also learning to manage his rapidly increasing social activities, his drinking habits, and various peer group pressures.

Foldvary and Lane (1969) observed that for all groups bar one, the risk of crashing is greatest when the driver is alone, but for teenagers, the accident risk is highest when there are two passengers riding in the car. According to Henderson (1971), amalgamation of all Foldvary's findings indicate that young drivers do not compare so badly with the rest of the population when they are driving alone, during daylight hours, on a week day. However, there is little data to back up this hypothesis and some data to refute it; e.g., Andreasson (1966).

Is the problem one of age or experience? The answer is probably both. McFarland (1978) cited a German study in which it was found that accidents were more frequent during the first 3 or 4 years of driving, regardless of the age at which driving was first undertaken. The reality, in Australia, is that a sizeable proportion of "novice" drivers are teenagers and vice-versa. It is also possible that males are more likely than females to be novice drivers whilst still a teenager.

Are young drivers more exposed? The answer clearly depends on the criteria used. Foldvary (1968), unequivocally revealed, for Queensland in 1961, that young drivers (under 20) on average have much lower weekly mileages than all other age groups. Furthermore, the incidence of drivers under 20 was very small in comparison to the next age group (20-29) a situation which may well have changed in the last 23 years.

It is not unreasonable to predict that novice drivers are more likely to be involved in pedestrian accidents. They are likely to have certain inappropriate expectancies (Brown, 1982) since experience is, by definition, the acquisition of perceptual anticipation.

Pelz & Schuman (1969) carried out an analysis of young U.S.A. male drivers in an attempt to establish why they are involved in more accidents and violations than men in their 40's. The basic question is whether the problem is one of inexperience or recklessness versus greater mileage and more exposure. In support of Foldvary's data, they found that young male drivers do have significantly lower annual mileage driven. However, the results do differ from Foldvary in degree. For Foldvary, the under 20 had a low mileage but for Pelz & Schuman the mileage rate per annum increases substantially for each year of age up to age 20 where it plateaux. Thus, at age 16 it was 4,000 miles, by ages 20 it was 14,000 miles. Accordingly, Pelz & Schuman took account of these differences in the 16-20 age group. As a result, they concluded that whilst most of the sample began driving at age 16, during the first year or two after receiving a licence they were driving more cautiously and were not as reckless as males 18-20 who had been driving for 2 or more years.

In a later study, Pelz & Schuman (1971) found that, for young men and young women, those with relatively higher mileages had more crashes than average, and received more tickets and warnings. Men and women who drove after midnight had more violations than average, and women who drove at night also had more accidents.

It appears that younger drivers are involved in many pedestrian accidents. Sandels (Skandia Report II, 1974) reported that 18-22 year old drivers were involved in more accidents concerning children under 10 years of age. Younger drivers were involved in proportionately more speeding, showed more faulty manoeuvring, and panic reactions. She felt that this was associated with their lack of maturity, self-centredness and unrealistic expectations of children. A more recent SWOV Swedish report (1977) confirms Sandels earlier findings.

Karpf and Williams (1982) point out that, in the U.S.A. in 1978, there were almost equal numbers of teenage (16-19) passenger and driver deaths in passenger vehicles.

In a more recent U.S.A. study, Williams & Karpf (1983) found that male drivers, between 16-19, had the highest per capita death rate; this was followed by male passengers, female passengers, then female drivers. The rates declined after 19 years of age for males, and 18 for females. For 13-year olds, half of the fatalities were passengers of a teenage driver. Teenage drivers accounted for 63% of fatalities for the 13-19 age group (67% for males; 58% for females); and the most lethal combination being male driver and male passenger. This pattern also held for injuries. Death for this group mainly occurred between 9.00 p.m. and 6.00 a.m., especially on Friday and Saturday nights, when vehicles would be used for recreational purposes, and the fatalities show a higher incidence of males over females.

Karpf and Williams (1982) had earlier suggested that one of the ways of reducing teenage deaths is to reduce exposure by:

- raising the minimum age of licensing to 17 or 18;
- eliminating high school driver education which results in more teenage drivers but not in fewer crashes;
- prohibit 16 and 17 year olds from driving during late evening/early morning hours.

Karpf's and William's suggestions are in need of careful evaluation. The essential point is, that a reduction in teenager driver accidents will have a sizeable effect on teenage occupant deaths and injuries. The same finding holds for Australia (see section 8.44 for a similar analysis to Karpf & Williams for Australia).

Williams and Karpf (1983) suggest that consideration should be given to prohibiting teenage drivers from transporting teenage passengers, who account for about three-quarters of the passengers fatally injured in their vehicles. They point out that teenage drivers are a major source of transportation for teenage passengers. Analysis of accidents by Foldvary and Lane (1969) suggest that the presence of teenage passengers, especially in large numbers, is associated with increased crash risk for teenage drivers. Williams and Karpf (1983) also argue that teenagers should not be allowed to transport other teens at night-time. Proponents of graduated licensing schemes could well heed the advice of Williams and Karpf and some suggestions from ten years earlier by Goldstein, Klein & Schuster (1971):

> "Since a few years beyond formal instruction appear to be necessary for development of dependable competence, an extended period of supervision after licensing seems eminently desirable" (Goldstein et. al., 1971, p.93).

Ruch, Stockhouse and Albright (1970) found, in 25% of the reported accident cases in their male college student questionnaire, that 'distractions' (including conversation) were cited as the causative factor (a cause seldom mentioned at the scene of an accident).

Driver fault is clearly a significant cause of deaths and injuries for child occupant accidents. However, it would appear that for child pedestrian and pedal cycle accidents the incidence of driver fault is much lower. Jarvis (1978) in an analysis of South Australia data between 1975-76 for pedestrian (all ages) movement suggests that:

> "Pedestrians involved in the above accidents were in some way responsible for 75% of cases. This responsibility varied, of course, from approximately 90% while crossing at uncontrolled sites to only 15% on pedestrian crossings and no responsibility for those struck on the footpath." (Jarvis, 1978, p.7.)

Jarvis' conclusion is similar to that arrived at in the UK studies by Blair (1969). With regard to responsibility for child involved accidents, Jarvis (1983) using the same data, concludes that children under 7 are responsible for over 90% of accidents as pedestrians or cyclists. School aged children are responsible for almost 80% of the pedestrian casualty accidents they are involved in and 66% of cycle accidents.

Brown (1982) in a review of Driver Behaviour factors involved in pedestrian accidents concluded

> "This review and other investigations of pedestrian accidents have identified the younger novice driver as a particular problem, especially in interactions with child pedestrians" (Brown, 1982, p.164).

The same review by Brown, leads to the conclusion that driver training shouldn't involve just road rules and skills but the need for "roadcraft" skills:

> ".... 'roadcraft' needs to be taught in a structured fashion, so that novice drivers do not develop a misplaced confidence in their vehicle control skills and thus place inappropriate demands on their limited decision making abilities in traffic. This is largely a question of interleaving 'roadcraft' education with the teaching of control skills. Effectively, it will involve training in hazard perception, especially the incorporation of road user behaviour into the information processed by the driver. Instruction in the limited pay-offs likely to accrue from excessive speed and the costs of such behaviour in the traffic system, are also likely to be informative and effective in improving the novice driver's decision skills." (Brown, 1982, p.164)

Henderson (1971 & 1972) had earlier suggested that there is no hard evidence that teaching driving skills lowers crash rates. There appears to be a lack of empirical research to refute Henderson's thesis. Nevertheless, the call for driver training is ever present; e.g., O.E.C.D. (1983).

> "Drivers and especially new drivers should be made aware of the child's capabilities and limitations in the course of driver instruction, education and licensing programs and through other appropriate means of information. In particular, a vehicle driver must fully understand that one cannot expect a child to behave in a safe manner. Therefore the driver should anticipate the child's reaction by reducing his speed and being prepared to brake." (OECD, 1983, p.85).

3.4 Summary of Environmental Factors

Children are more likely to be involved in road accidents during daylight hours and mostly in the afternoon. There is substantial evidence in Australia, and overseas, that pedestrians and pedal cyclists are most at risk mid to late afternoon after school. The risk increases as the afternoon enters early evening for older children. During the weekdays, the two hours immediately following school are the most dangerous. Of a weekend, the peak is still early afternoon but it is not so marked. According to hospital records, bicycle accidents involving hospital treatment are more likely to occur of a weekend (afternoon) than on weekdays.

Whilst school is clearly related to pedestrian and pedal cycle accidents, it must be noted that many children involved as pedestrian casualties in the afternoon peak had been home or to a friend's place before the accident. Frequently, other children are present when the accident occurs.

With respect to pedal cycle accidents, changing direction is the major problem. Accidents involve right angle collisions at intersections and unpredictable behaviour. The most dangerous manoeuvres are associated with intersections, either turning right from left to centre lane or travelling across an intersection in the left hand lane.

Local residential or neighborhood streets account for a large number of child road accidents. These accidents do not only involve intersections but also occur mid-block.

In many instances drivers see pedestrians and pedal cyclists well before the accident. The evidence suggests that more blame for child road accidents should be attributed to drivers than is currently the case since pedestrians, in particular, are more likely to take evasive action than drivers. Drivers are reticent to slow down, or stop, especially if they are driving at 60 kph or greater speeds.

Young or novice drivers appear to be over-involved in accidents in which children are casualties. This is particularly true for vehicle passengers, and also to a lesser degree, for pedestrian accidents.

4.0 IN-DEPTH ANALYSIS OF ACCIDENT RECORDS ACROSS THREE STATES

This section of the report begins with an outline of the methodological approach employed in obtaining and analysing data pertaining to road crashes involving children for the years of 1981 and 1982 in N.S.W., Victoria and Queensland. 342 accident records were examined in-depth, involving 350 child casualties. The analysis of the records lead to the development of accident scenarios using primarily the main contributing factor. Multiple causation was also examined. The scenarios varied by road user type and by age of the child. The remainder of the chapter is devoted to an analysis of the mass data systems for child casualties in N.S.W. and Victoria for 1981 and 1982. The data used in the statistical analyses involved general road user analyses as well as some of the specific scenario groups. Additionally where applicable, the 1981 DOT Fatal File provided National data on child road deaths.

4.1 The Methodology

4.11 The Idiographic Approach

As a general rule, most published studies dealing with the analysis of road crashes involving children rely on the analysis of statistics; i.e. the manipulation of data bases. The approach is normally nomothetic. The data is numerical with the analysis involving cross-tabulations (correlational).

A key aspect of the study reported in this volume is it's idiographic nature where the data base is individual case records. Whilst the search process is similar to the normal nomothetic studies, the unit of study is the individual record, not aggregated data or numerical counts. Numerical counts are important to the idiographic process but are not the starting point.

The dictum 'correlation is not causation' is ever so relevant in the search for causative factors in child road deaths or injuries. Most researchers recognise that the ideal way to seek out causal factors is to reconstruct the accident. In reality, this is rarely ever possible. The judicial and enforcement system attempt to piece together the events as accurately as humanly possible, frequently with a motive of attributing fault or blame. Accordingly, one means of attempting to gain a better understanding of those factors contributing to child road crashes is to utilise the existing detailed recorded reconstruction of the events which took place. Where a child road death occurs there is usually considerably more detail available relating to the 'events' up to and including the time of the accident. Thus, the study of causal factors is best concentrated on accidents involving a death rather than an injury.

4.12 The Data Base

The data presented in this section of the report summarises an analysis of 342 accident records involving 350 children under 17 years of age in 1981 and 1982 in N.S.W., Victoria and Queensland. Most (297) of the 342 records involved a child fatality. The emphasis on 'fatals' occurred because the data base was much richer in these cases than in the case of the injured children.

FIGURE C

CHILDREN'S ROAD CASUALTY STUDY - 1984

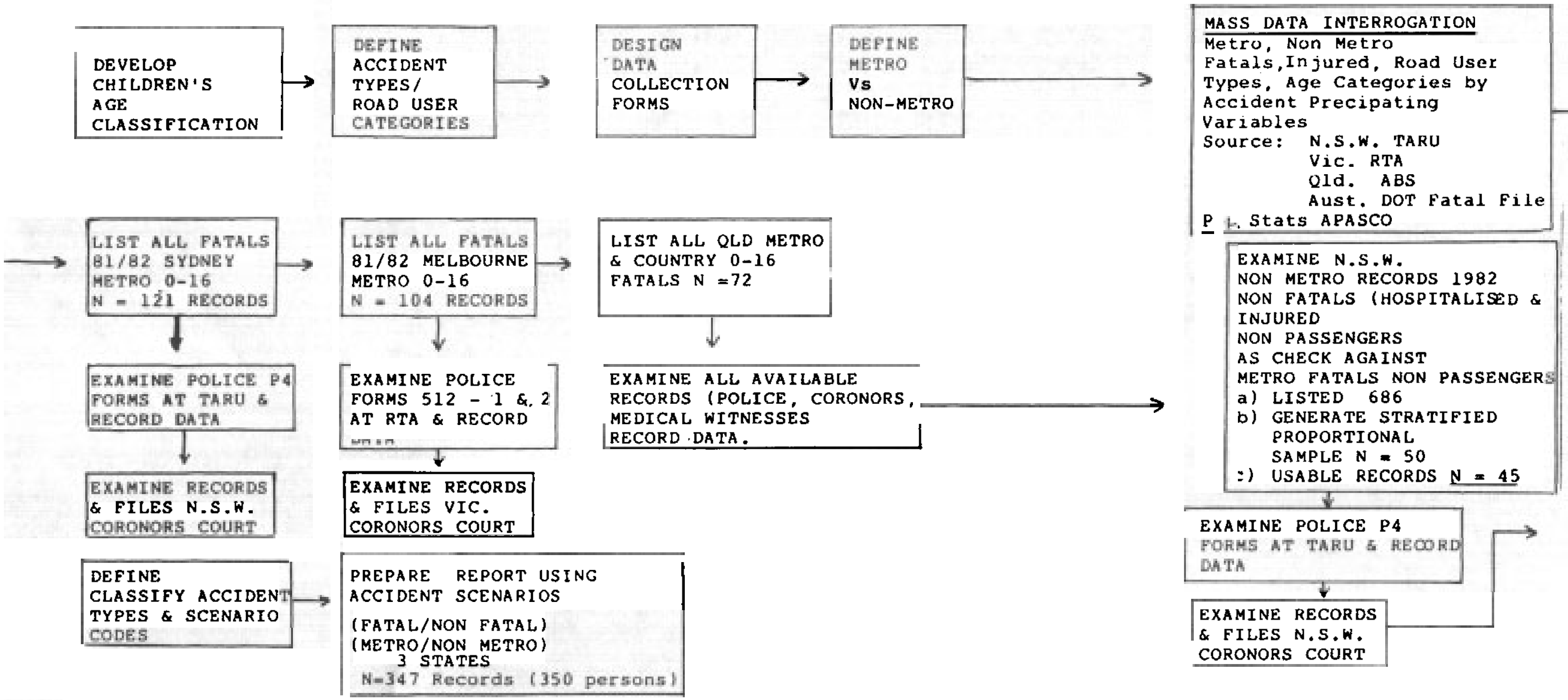


Figure C details the procedures employed in gaining and analysing the data used in this chapter. Initially a computer run of N.S.W. Metro child road death accident record numbers was generated. In N.S.W. and Victoria it was all metro child deaths, and in Queensland all child road deaths. An attempt was made to read every case file readily available. Apart from Queensland, non-metro files were not readily available. The Police Accident reports were sourced and carefully scrutinised. The Coronial Records were then read in detail including, where available, original report of witnesses, witnesses' depositions, transcripts of Coroners' Court, pathology reports, summary of hospital records, and the original police accident report.

In theory, a random sample would have been desirable, or better still, a census. However, it is not always practical to easily gain access to the records because some are lost, or filed in the country, or unavailable because legal action is pending.

In addition to the records of fatal accidents, a listing was made for non-metro 1982 N.S.W. non fatals. 686 accident record numbers were generated. This excluded vehicle passengers since some of the fatal records provided data on other children injured. Furthermore, the records pertaining to vehicle occupants provides little usable causal data. From the 686 numbers a stratified proportional sample was generated; i.e. 21 pedestrians (pop. 296), 10 motorcycle (pop. 131) and 19 pedal cycle (pop. 259). Thus a sample of 50 numbers were generated representing non-metro non-fatal other than vehicle passengers. The Police Accident Report forms for each of these 50 accident victims were carefully scrutinised so as to ensure that the fatals already examined were not a uniquely different sample from the much larger base of injured. This preliminary analysis suggested that the antecedents of fatalities are not significantly different to that of seriously injured casualties. However, this assertion cannot be demonstrated with any degree of certainty from this data because of the general lack of recorded information on the Police Accident Report form relating to the antecedent factors involved in non-fatal accidents. Indeed, the 50 accident records for non-fatals generated only 45 cases worthy of detailed investigation in the subsequent analysis. The other 5 records provide little or no causal type data, (i.e. one in every ten were not usable).

Thus, the sample of records analysed is heavily biassed in favour of records of both fatal accidents and metropolitan crashes. The details of the sample records follows. The 342 accident records involved 350 child casualties under 17 years of age.

TABLE 49

NUMBER OF ACCIDENT RECORDS STUDIED (1981/82)

	N.S.W.*		Vic.**		Q'ld.***		
	City	Country	City	Country	City	Country	Total
Fatals	121	-	104	-	23	49	297
Hospitalised	-	24	-	-	-	-	24
Treated Injured	-	21	-	-	-	-	21
Total	121	45+	104	-	23	49	342

* 2 accidents involved two child deaths
** 2 accidents involved two child deaths
*** 4 accidents involved two child deaths.
+ 5 other accidents were not usable.

The final output for each accident examined was a summary of the accident from the point of view of the principle causes or antecedent factors. In order to cope with the mass of qualitative data generated, it was decided to adopt the Herbert & Humphreys (1978) approach developed for the "Fairfield on-Scene Study of Collisions" where factors were classified as:

"(a) The main contributing factors: The events which precipitated and without which the crash would most likely not have occurred.

(b) Secondary contributing factors: The events which aggravated the pre-crash situation, making the crash more likely.

(c) Uncertain contributing factors: Those events where there was considerable informational uncertainty about either the existence or extent of their influence in the pre-crash phase."
(Herbert & Humphreys, 1978, p.6-7).

Unlike the Fairfield Study, which concentrated on the development of detailed accident case history records, the current study set out to develop scenarios which would (a) reflect regularly occurring patterns, and (b) incorporate most of the accident records, i.e. be exhaustive.

4.13 Interrogation of Mass Data Bases

The case study method is potentially the most heuristic but expensive way to diagnose the contributing factors if carried out as an on the spot in-depth crash study such as the Fairfield Study (Herbert and Humphreys, 1978), the Adelaide Study (McLean, 1979) the Melbourne Study (Health Commission of Victoria, 1978). In the current instance, the study had to be post hoc.

As noted, the case study data base was biassed in favour of urban and fatal accidents because of ease of access of records. To overcome these weaknesses additional analyses were also undertaken so as to ensure that a broader framework took account of:

- geographic differences by state and by region (metro versus non-metro);
- degree of injury (fatal, hospitalised, treated injured);
- sample size deficiencies.

The analyses undertaken involved the interrogation of three separate mass data bases:

(1) The "Fatal File" DOT, Federal Office of Road Safety - all fatals, Australia, for 1981.

(2) The Traffic Accident Research Unit (TARU) (NSW) file of all road accidents involving injury or death for 1981 and 1982.

(3) The Road Traffic Authority (RTA) (Vic.) file of all road accidents involving injury or death for 1981 and 1982.

The first step, in all instances, required the creation of files of accidents involving children 0>17, including the four age splits as indicated in section 1.9. For the 'Fatal File', and the TARU file, initial tabulations were run, relating age categories to metro versus non-metro and category of road user, by the following accident/injury precipitating variables suggested as likely to be relevant from a review of available literature including:

day of week
month of year
time of day
type of location
manoeuvres
sobriety
seat belt usage
position in vehicle
status of registration
status of licence
years of driving experience
year of manufacture of vehicle
sex of driver
age of driver.

Once the key scenarios were developed, nine were selected for further analysis using the TARU mass data base. The same cross tabulations, where relevant, were carried out for each of the nine scenarios, so as to derive more definitive data to support the scenario descriptions obtained from the original 342 sample case accident history records (297 of which involved fatals).

This use of nine specific scenarios resulted in small sample bases and created problems in interpretation. Accordingly, in interrogating the Victorian (RTA) Mass Data base some of the scenarios were aggregated.

4.14 The Practical Problems in Post Hoc In-Depth Studies

The current study highlights the need for a National Body to be responsible for data collection, storage and analysis. Currently, each State acts independently so that even basic age groups are not similar. Accident reporting forms vary dramatically, and so too does the availability of data. It is tempting to suggest that what is needed most of all is a more thorough Police Accident Report Form aimed at providing the type of data needed to describe the precipitating pre-crash factors so as to obviate the need for expensive in-depth studies such as those mentioned in section 4.13. However, two aspects need also to be considered. First, at the time of an accident in which a child is involved (especially if killed), those involved actively or as witnesses may be overwhelmed. Second, where action is to be taken the level of reporting is generally reasonably satisfactory but most of the critical data appears not in the Police record but in witnesses' depositions, Coroner's and Hospital reports. Whilst the Police reporting form could be improved somewhat, there is a more urgent need to centralise all parts of the case record as occurs now in Queensland. Additionally, where no further legal action is to be taken more thorough reporting is still required.

In general, post hoc analysis of Police Accident Records using either an idiographic or nomothetic approach is plagued by a lack of detailed reporting of 'causal' or precipitating factors.

Additionally, the almost total absence of exposure data from which any risk estimates can be generated poses serious problems in interpreting the accident data obtained. The data that does exist is insufficient to enable meaningful estimates of risk to even be attempted.

4.2 Analysis of 342 Individual Accident Case Records (N=350 children)

4.21 A Caveat

The data presented in this section of the report ought to be regarded as 'hypotheses'. The procedures employed were more related to the methodology of a 'search' than that of a 'test'.

The idiographic approach is, of necessity, qualitative, exploratory, and explanatory, relying heavily on the quality of the source data and the ability of the analyst to 'dig' and hypothesise. Furthermore, if generalisations are to be made, the validity of such generalisations is largely dependent upon the nature of the sample of cases being investigated.

The 'search' process is enhanced by the richness of the data rather than the availability of substantial numbers of cases. Fifty extremely complete accounts is far more heuristic than hundreds of mostly incomplete accounts. Regrettably, the state of the data, as it currently exists in Australia, meant that the 'search' process had to rely on a wide net rather than a detailed analysis of a small number of complete records owing to the lack of complete data in so many of the accident records.

4.22 Methodology

This section details the operations carried out and summarised in figure C (see 4.11). As already mentioned, children were to be defined, for the purposes of this study, as those between the ages of 0 and 16 years inclusive. Some of these children, i.e., those aged 16 years and 9 months in N.S.W. were in fact, drivers of vehicles. In some other States, children under the age of 17 years are not allowed to drive vehicles. Even in N.S.W. the child driver population has to be accompanied by another person holding a full ('black') license. As indicated in section 2.42, drivers of vehicles were excluded in all the cross-tabulations. The same restriction applied to scenario analyses. The definition of the types of accidents: was limited to vehicle passengers; cyclists; motor-cyclists and pillion passengers; and pedestrians.

As a start, the Traffic Accident Research Unit (TARU) in N.S.W. was asked to list all those children involved in fatal accidents during the years 1981 and 1982 indicating their category of road user.

This list produced the accident record number which acted as a source to the original N.S.W. Police Reports (Form P4). These reports were read in detail, especially the circumstances and data surrounding the accident. From these reports, the date and time of death, as well as the hospital and the name of the particular child involved were noted. The next step involved the Coroner's Court where the records regarding the death of the child were sourced.

Prior to the reading of the original accident report forms, a data collection form was designed, in order to record all the information regarding the factors surrounding the child's death (see Appendix). At the same time as the N.S.W. case records were being analysed, a similar procedure took place in Victoria including the sourcing of the original Traffic Accident Report (Forms 513-1 and 513-2).

Access was gained to original Police Reports of witnesses, witnesses' statements and depositions, transcripts of Coroner's Court records, pathology reports, summary of hospital reports, and original testing laboratory accounts. The original objective was to build sample scenarios of the circumstances surrounding each child's accident by analysing the information sheets. A general description was formed of each accident regarding the factors, circumstances, behaviour prior to the accident, other people involved, reason for journey, emotional state of the child, environment, supervision, carelessness, inexperience, and fatigue, etc., etc. Specific factors were also examined with respect to sex, age, road type, alcohol involved, traffic conditions, time of day/month, registration and year of manufacture of vehicle, licence, type of licence of driver involved, traffic manoeuvres, etc.

Based on the preliminary findings of an extensive literature survey, children were bracketed into the following age groups:

0 - 4 years (pre-schoolers)
5 - 7 years (infant schoolers)
8 - 12 years (primary schoolers)
13 - 16 years (secondary schoolers)

These were further divided into males and females. These age break-ups followed suggestions from a preliminary literature search, whereby those in the 0-7 year old group are deemed not to be able to cope with traffic, and believe that running fast is the safest way to deal with an unfamiliar situation; the 8-12 year old and 13-16 year old groups are the heavy bike user group, and the 13-16 year group get involved as vehicle passengers, and drivers of vehicles illegally, with their peer group.

The process of collecting each individual case record is very time consuming. Adding additional cases is of value only in so far as it generates new hypotheses or modifies existing ones. Initially, the 'search' process which began with N.S.W. accident records, concentrated on fatals which took place in the metropolitan area. This raised two questions:

(a) Do road accidents involving a child fatality have a different set of causal or precipitating factors from non-fatal accidents?; and

(b) Are accidents in non-metro areas different from those in metro areas?

Informal discussions with traffic accident experts lead to the hypothesis that there is no difference in the circumstances surrounding an accident involving a fatality and an accident resulting in a hospitalised or treated injury. The difference is believed to frequently lie largely in the speed of the vehicle. In order to substantiate the 'no difference' hypothesis a random sample of 50 hospitalised and injured children's accidents in non-metro N.S.W. were examined by reading the Police Accident Reports (Form P4). This analysis was unable to justify the need to spend hundreds of additional hours collecting country records, since it appeared that non-metro accidents were similar in nature (but not necessarily incidence) to metropolitan accidents.

Further, there appeared to be no apparent differences between fatals and non-fatal accidents except with regard to the amount and quality of data included in records. In general, where a fatality occurs, the data is much more comprehensive than if the accident does not result in a child death.

Once the analysis of Victoria (Melbourne fatalities only) and N.S.W. records had been completed, Queensland records were also examined using, as a source, Form 12836/10181. Queensland provided a unique opportunity of gaining easy access to a sizeable number of country fatalities because of a centralised system of keeping complete and detailed records. In Queensland, both metro and non-metro (mostly the latter) fatality records were scrutinised. In all, 342 accident records were analysed and involved 350 child accident victims. The details were provided in table 49.

The issue of basic differences between metro versus non-metro and fatal versus non-fatal is included in the analyses in section 4.3 using the statistical analysis of the mass data systems and is based on all child casualty records.

Finally, where a choice in relation to the selection of records was available a deliberate attempt was made to under-sample fatalities involving vehicle passengers. Vehicle passengers account for approximately 50% of child road accidents and almost as many child road deaths. However, the precipitating causes are beyond the influence of the child with the exception of seat belt usage. Jarvis (1983) distinguishes between children as "active participants" in accidents versus accidents involving children in "other people's accidents" (i.e., as a car passenger).

4.23 Analysis by Road User Category - Main Contributing Factor

The following analysis categorises accidents according to 'main' contributing factor. In general, one contributing factor has been attributed to each case. It is, of course, recognised that a multiplicity of factors are involved at various phases of a crash (Haddon, 1972). However, adopting the Fairfield On-scene Study approach (Herbert & Humphreys, 1978) accidents were categorised in terms of the 'main' contributing factor.

Analysis of the individual accident records has resulted in a series of scenarios for each of the four categories of road accident users.

Taking children 0-16, as a group, the following scenarios stand out as important, at least with respect to frequency and keeping in mind that most of the records involved a child fatality.

Vehicle passengers	- no seat belt - joy riding/teenagers - driver fault
Pedestrians	- unattended child - running and running from behind parked vehicle - driver fault
Pedal Cyclists	- failure to obey road rules
Motor cyclist/	- incorrect manoeuvres
Pillion Passengers	- trail bike on road.

Each of the scenarios will now be described in more detail.

A. Vehicle Passengers
"No Seat Belt"

This scenario is typified by a family on the way home from an outing, occasionally alcohol is involved, with a small child not in a restraint and sleeping, and in some instances nursed by the mother. During the accident the child is thrown around the vehicle and it is not uncommon for those on the scene of the accident to see a child outside of the vehicle whilst the other members of the family are still secure in the vehicle. There are also situations in which the child falls out of the vehicle or climbs out of a vehicle. Additionally, a typical part of this scenario is the late afternoon at weekends with both child and parents likely to be somewhat tired after a day out.

In establishing this scenario it must be noted that no seat belt is also applicable to some of the other scenarios relating to vehicle passengers. However, what differentiates the 'no seat belt' group is that they do not easily fit into any one of the other scenarios.

In terms of the records examined the following observations were noted:

- 0-4 years of age (38%)
- 5-7 years of age (23%)
- of the 0-4 age group (73%) were female
- peak days Saturday and Sunday
- peak times 4-6 p.m. (Urban) and 4-5 p.m. (rural).

Overall this scenario accounted for over 40% of the vehicle passenger child accident records studied. Whilst it might be tempting to analyse seat belts in more depth the data does not allow even tentative answers to questions like - "How many might still be alive if they had been wearing a seatbelt or using a child restraint?" or "Why did those who did wear a restraint die?"

"Joyriding"/Teenagers

The term "Joyriding" has a variety of meanings. According to the dictionary "joy-ride" is a pleasure ride in a motor car especially when the car is driven recklessly or used without the owner's permission. In most instances, in this scenario, joy-ride refers to reckless driving involving the presence of a teenage driver accompanied by teenager passengers. Since joyriding also has the connotation of a stolen vehicle, this scenario will also be called "teenagers".

This scenario is typified by a group of teenagers with one or two boys 17 years of age, after the pub or party, crowded into an older model vehicle, usually with few seatbelts, some alcohol but usually not above the prescribed limit, and several younger girls (15-16 yr.). The driver has usually only held a license for a short period or is still on a provisional license and loses control of the vehicle and may be involved in a multiple fatality accident. It can involve an accident with another vehicle, but is just as likely to be a run-off-the-road without another vehicle involved.

This scenario accounted for 22% of the child vehicle passenger accident records reviewed. Most significantly, 84% of these 22% involved teenage passengers (13-16 years of age).

"Driver Fault"

The accidents involving children in these situations did not appear to involve any fault of the child and were caused by driver error or misjudgement. Such factors which contributed to these types of accidents were falling asleep at the wheel; BAC levels above legal limit; failure to obey the rules of the road.

This scenario accounted for 24% of the child vehicle passenger accident records investigated.

"Other Non-Driver Factors"

This scenario is typified by accidents which seemingly appear not to be caused by driver or child error and this appears to happen by chance. In most instances, they were, to a degree, unavoidable and contributing factors were weather, visibility, mechanical failure, etc.

This scenario involved only 10% of the child vehicle passenger records.

B. Pedestrians

"Unattended child"

This scenario is typified by an adult, usually the immediate parent allowing the child to wander away whilst playing, while walking along a street or leaving the child unattended for what is usually only a short period of time. These "toddlers" then unknowingly expose themselves to street traffic, construction equipment, or reversing vehicles in driveways. This type of accident can take place in the immediate home environment with parents and or delivery vans reversing over children, or while a Mother is attending to one child in the vehicle the other child wanders, or with a brief lapse of concentration or attention by a parent along a footpath. An unconscious lack of parental supervision is usually the cause of this type of accident. In these situations the child is almost never seen by the driver who has little or no warning prior to the accident. The parent is most usually unaware that there is a danger to the child.

This scenario accounted for 27% of the child pedestrian accident records which had a slight bias towards males (60%) and to children aged 2-3 years (63%).

"Running"

This scenario is typified by primary school age children running or darting on to the road without any prior warning to the driver. These accidents are involved with "attractions" which distract the child from paying attention and include a parent or friend signaling from the opposite side of the road, going to or from a shop on an errand or for personal purchases, icecream vans, playing or chasing friends on the footpath. Also included, but to a lesser degree, are alighting from a school bus, activity after school at school crossings and close to the school with large numbers of children, using the center of the road as a safe zone, and failure to obey the rules of the road such as crossing against a red light or use a cross walk. The most significant factor in this type of accident is the running movements by the child which are often seen by the driver in advance along the side of the road but give little time to avoid when the child darts onto the road unexpectedly. Parked vehicles are involved in a significant number of these scenarios.

This scenario accounted for 32% of the child pedestrian accident case records. It had a substantial male bias (72%) and involved mostly primary aged children (5-12 years) (87%). The case records revealed a peak on Thursday for metro records and Friday for country cases with 3-4 p.m. the peak time of day.

In many instances the child is seen by the driver well before the child enters the road. In the scenarios, roughly 2 in 8 were not seen at all, 3 in 8 were seen just before, but another 3 out of 8 were seen well before.

"Driver Fault"

The accidents involving children in these situations did not appear to result from any negligence by the child and were caused by driver error or misjudgement or chance. Such factors which contributed to these types of accidents were failure to stop at traffic lights or pedestrian crossings, vehicles leaving the road, speed, etc. In most instances the child was not involved in any of the manoeuvres described above.

To be classified as driver fault some legal action was taken concerning the driver. The scenario accounted for 19% of the child pedestrian accident records. Of these 19%, 40% of the drivers had a BAC level above the prescribed limit, 27% were charged with culpable driving and 33% with negligent driving.

"Other Non-Driver Factors"

This scenario is typified by accidents which were not caused by driver or child error and happen by chance. In most instances, they appear to have been largely unavoidable and contributing factors were weather, visibility, mechanical failure, etc.

C. Pedal Cyclists

"Failure To Obey Road Rules"

This scenario is typified by two, and sometimes more boys cycling together and not paying attention to traffic rules by riding out of side streets, driveways, t-intersections, veering onto the wrong side of the road into oncoming or following traffic unexpectedly. This treatment of the roadway as an extension of the play ground, so to speak, and the darting into traffic at right angles similar to a pedestrian causes extreme problems for motorists as there is little or no time to take evasive action.

As in the case of pedestrians, drivers often see the cyclists beforehand and slow down but it is the unexpected behaviour on the road which causes this type of accident. It must be noted that children are normally basically predictable in their road or road entering behaviour as pedestrians or cyclists, but somewhat less so than adults. Drivers normally expect people (adults and children) not to enter the road and so are caught out when they do so unexpectedly.

This scenario accounted for 67% of all the pedal cyclists accident records investigated. Most were males (90%) and in the sample studied there was a country bias. The age groups most involved were the older teens (13-16 years) (55%) and the 8-12 year olds (33%). The peak time was 4-6 p.m.

A feature of this scenario is the presence of other children also on pedal cycles. In 50% of the cases in this scenario there were 2 children. Of the remaining 50% a number also involved 3 or more pedal cyclists.

"Driver Fault"

The accidents involving children in these situations did not appear to be a result of any negligence by the child. They were caused by driver error, such as crossing to the wrong lane, being above the prescribed B.A.C., backing out of a drive without looking, running into the rear of a cyclist.

As a scenario, this group only accounted for 15% of the child pedal cyclist's case records examined.

"Other Non-Driver Factors"

This scenario is typified by accidents which, it appears were not caused by driver or child error and seem to happen by chance. Such instances are mechanical failure, inexperienced riders, poor visibility at night, borrowing a bike, out of control down a steep drive. In most cases, these accidents appear to have largely been unavoidable by the driver.

D. Motorcyclists & Pillion Passengers

As a group, they accounted for only 7% of the total child accident records examined. The great majority were males and the drivers were often unlicensed. This scenario is typified by an unlicensed driver in some instances on an unregistered, uninsured motorbike which has been borrowed. It usually involves losing control of the vehicle and hitting the curb, ditch or side of the road, being unable to stop, and, in some instances, with an illegal pillion passenger. The scenario involves mostly a failure to obey rules of the road and inexperience. A sizeable proportion of these accidents occur en route to or from the "trail" ie. on the road to or from where the trail bike activity is largely taking place.

FIGURE D

SCENARIO CODES

N	-	number of individuals
NS	-	no seat belt fitted and/or worn
J	-	joyriding
DF	-	driver fault
ND	-	other non driver factors
UA	-	unattended child
BR	-	behind parked vehicle and running
R	-	running onto road unexpectedly
OR	-	failure to obey road rules
C	-	stopped in centre of road
A	-	attraction
IN	-	borrowed bike, inexperienced rider
TB	-	trail bike, on road
I	-	incorrect manoeuvres

ANALYSIS CODES

Children's Road Accidents

F	-	Family Outing	R	-	ran on road
H	-	hit and run	B	-	out from behind vehicle
J	-	Joy Riding/Teenagers	A	-	accompanied by brother
L	-	Lost control vehicle	B/S	-	or sister
IN	-	Inexperienced driver/rider	C	-	centre (of road)
O	-	Outside street (cyclist)	IC	-	ice cream van
NS	-	No seatbelt fitted*	PF	-	playing with friends
SB	-	Suspected or verified	S	-	school going to or from
		fitted but not worn	SP	-	shops
U	-	Unlicensed driver	HO	-	home close
A	-	attraction	UA	-	unattended child
E	-	errand for parent	DR	-	child failed to obey
DC	-	driver charged			rules of road
BA	-	Blood alcohol suspected			(pedestrian/cyclist)
AC	-	chance accident, no fault	DOR	-	driver failed to obey
V	-	veering			rules of road
T	-	T intersection			(v. passenger)

Sort Codes

ND	-	Other non-driver factors
DF	-	Driver Fault
C	-	Centre of road
I	-	Incorrect Manoeuvres

* Whilst this factor is not an accident precipitating factor it is included because of its importance as an injury precipitating factor.

4.24 Analysis by Age and Road User Category - Main Contributing Factor

Analysis of the accident records in terms of the four age groupings assists in the process of seeking out the major problem scenarios. In the charts which follow the numbers and percentages refer to the case records examined for that age group. Again, the data is mutually exclusive so that each accident is attributed to one major contributory cause. The codes used for analysis appear in Figure D.

A. Children 0-4 years of Age

Table 50.A below reveals that the most significant scenarios for this age group are:

* Pedestrian - unattended

* Vehicle passenger - without child restraint.

With respect to the unattended 0-4 year olds involved in road accidents boys outnumbered girls two to one. The reverse was the situation for those very young children involved in accidents as vehicle passengers - girls outnumbered the boys two to one.

TABLE 50A — 0-4 years

N = 70

Vehicle Passengers						Pedestrians								Cyclists
N = 20						N = 48								N = 2
NS		DF		ND		UA		DF		ND		C	A	D OR
16		3		1		40		4		2		1	1	N = 2
M	F	M	F		F	M	F	M	F	M	F	M	F	F
5	11	2	1		1	26	14	2	2	1	1	1	1	2

B. Children 5-7 years of Age

Table 50.B reveals that only small number of specific scenarios account for most of the case records for this age group.

Vehicle passengers - non use of child restraint

Pedestrians - running (including from behind parked vehicle)

Pedal Cyclist - failure to obey road rules.

Boys and girls aged 5-7 are likely to be involved in vehicle passenger accidents through the non use of child restraints or adult seat belts. At this age level, boys account for most of the pedestrian accidents including the "running" accidents and the driver fault accidents. Similarly it is the boys in this age group who account for the cyclist accidents where road rules are disobeyed.

TABLE 50.B 5-7 years N = 79

Vehicle Passengers

N = 17

NS		J	DF	ND	
N=10		N=1	N=4	N=2	
M	F	M	F	M	F
5	5	1	4	1	1

Cyclist

N = 17

OR		DF	ND	
N=11		N=3	N=3	
M	F	M	M	F
8	3	3	2	1

Pedestrian

N = 45

UA	BR		DF		R		OR	ND	C	
N=2	N-23		N=7		N=6		N=2	N=2	N=3	
F	M	F	M	F	M	F	M	M	M	F
2	17	6	3	4	5	1	2	2	1	2

C. Children 8-12 years

As children get older the range of scenarios, needed to explain most of the accidents, increases. The main scenarios are:

Pedal cyclists - failure to obey road rules

Pedestrians - running including from behind parked vehicles

Vehicle Passengers - non use of seat belt.

At this age, boys on pedal cycles who don't obey (or know?) the rules of road are a very significant scenario and so too are the boys who run on the road and from behind parked cars.

TABLE 50.C 8-12 years N = 82

Vehicle Passengers N = 13

NS N=6		DF N=4		ND N=3	
M	F	M	F	M	F
2	4	3	1	1	2

Cyclists N = 29

OR N=21		DF N=3	ND N=5	
M	F	M	M	F
17	4	3	4	1

Pedestrians N = 39

UA N=1	BR N=18		DF N=6		R N=5		OR N=3		ND N=1	C N=3	A N=1
F	M	F	M	F	M	F	M	F	M	M	M
1	14	3	4	2	2	3	2	1	1	3	1

Motor Cyclist N = 1

I N=1
M
1

D. Children 13-16 years

At this age a sizeable number of scenarios are needed to account for most of the accidents. It is significant to note that at this age group "driver fault" becomes a relatively more important scenario for the three major road user categories. This may reflect the ability of older peers who might witness an accident to be able to defend the actions of the teenager involved. As such, it raises the question as whether or not 'driver fault' as a scenario is all too often understated in the younger age groups.

TABLE 50.D 13-16 years N = 119

Vehicle Passengers N = 43

NS N-11		J N=18		DF N=11		ND N=3	
M	F	M	F	M	F	M	F
7	4	9	9	7	4	2	1

Cyclists N = 26

OR N=16	DF N=6	ND N=4
M	M	M
16	6	4

Pedestrians N = 25

BR N=6		DF N=13		OR N=2		ND N=3	A N=1
M	F	M	F	M	F	M	M
2	4	7	6	1	1	3	1

Motor Cyclist & P.P. N = 25

IN N=3	TB N=6	I N=11		ND N=5	
M	M	M	F	M	F
3	6	9	2	4	1

The key scenarios are:

Vehicle Passengers - (teenagers i.e. teen drivers
and multiple teens in car)

Pedestrians - driver fault

Pedal Cyclists - failure to obey road rules

Motor cyclist/ - incorrect manoeuvres
Pillion Passengers

To a degree the above is an oversimplification. Nonetheless, these scenarios are significant. Additionally, however, other scenarios should not be overlooked including:

Vehicle passengers - not wearing seat belt
- driver fault

Pedestrians - running and parked cars

Pedal cyclist - driver fault

Motor cyclist - trail bikes on road.

4.25 Analysis of Accident Records - Multiple Causation

In analysing the accident records the approach of Herbert & Humphreys (1978) was adopted whereby the emphasis was on identifying the main contributing pre-crash factors. In the analysis this far one main contributing factor has been assigned to each accident. Road Accidents, however, are rarely the result of a single factor. The Federal Office of Road Safety in 1982, in recognition of the multiple causation in road accidents, developed a leaflet entitled "The Road Safety Matrix", based upon the work of Haddon (1972).

An attempt was made to apply the matrix approach to the case studies. However, little progress was made because of the inadequate nature of accident reporting, at least with respect to causation. The result of this analysis lead to the conclusion, that on the basis of accident report data a large proportion of accidents involving children 0-16 appear to be primarily (even exclusively) the result of one contributing pre-crash factor (Table 50.E).

Table 50.E reveals that the analysis leads to the conclusion that most of the reported accidents had only one main contributing cause. However, in at least one in every four accidents it was possible to nominate at least one other main contributing factor.

TABLE 50.E ACCIDENT SCENARIOS AND NUMBER OF CAUSES

Scenario		Number of Causes One	Two	Three
(NS)	No seat belt fitted or worn	27	12	3
(UA)	Unattended child	40	6	-
(OR)	Failure to obey road rules	44	12	2
(DF)	Driver fault	49	12	1
(J)	Joyriding/teenagers	8	6	4
(ND)	Other non-driver factors	18	8	1
(BR)	Behind parked vehicle and running	34	13	-
(I)	Incorrect manoeuvres	4	7	1
(TB)	Trail-bike on road	4	2	1
(R)	Running out unexpectedly	10	1	-
(IN)	Borrowed bike, inexperienced rider	1	2	-
(A)	Attraction	2	-	-
(C)	Stopped in centre of road	6	-	-
(O)	Other	2	-	-
	All Factors	249	81	12

Analysis of the accident records revealed that in very few instances, where multiple causes could be identified, did any pattern of multiple causes emerge, nor was any particular multiple cause associated with any scenario type. The only exception was the joyriding/teenagers scenario where the inexperience of the driver and faster than normal speed contributed to loss of control, particularly on turns, curves in the road or when overtaking.

Across all the scenarios lack of experience and lack of control were frequently present as factors contributing to accident occurrence with pedal cyclists, motor cyclists and drivers (e.g. younger pedal cyclists hit kerb or bump and lose control).

Another common occurrence within many scenario types was the failure to stop or give way at T-intersections resulting in a collision. Speed and failure to negotiate turns also feature in a number of scenarios (e.g. joyriding, driver fault, failure to obey road rules).

4.26 Summary of Scenario Analysis

The in-depth analysis of case records leads to the conclusion that child road accidents consist of many different accident patterns which vary by age and by road user type.

The youngest (pre-school) age group (0-4 years) are primarily involved as pedestrians and vehicle passengers. As pedestrians, the likelihood is they are left unattended usually for only a relatively short period of time. Young children involved as vehicle passengers (especially as a fatality) are likely not to be using any form of restraint.

The early primary school-aged-children (5-7 years) are involved in road accidents as pedestrians, vehicle passengers and cyclists. As vehicle passengers restraints are unlikely to be worn. As pedestrians, it is largely boys and many are running on to the road often near a parked car. The pedal cyclist casualties lack the skills and/or disobey road rules. The records rarely attribute casuality to driver fault.

The upper primary school-aged-children (8-12 years) become casualties through crashes as cyclists and pedestrians or as vehicle passengers and exhibit similar patterns to the 5-7 year olds. Boys, in particular, are a problem because of running from behind parked cars and boys with bicyles who disobey road rules.

Whilst the high school teenage group (13-16 years) are likely to be involved mostly as vehicle passengers, they require a much larger number of scenarios to account for their casualty accidents. As vehicle passengers they are likely to be associated with young drivers, multiple occupants, no seat belt and driver at fault - (joy-riding scenario). This age group are involved as pedal cyclists not obeying the rules and as innocent victims of drivers. As pedestrians, they are likely to be innocent victims of careless drivers. In this age group, motor cycle drivers and pillion passengers are significant including trail bikes on roads. Whilst small in numbers, illegal drivers of cars must also be included.

4.3 Analysis of Mass Data Bases

The idiographic analysis of individual case records is most useful for generating hypotheses and developing global scenarios. However, generalisations from such data are questionable because of the small sample bases and the failure of the sample to accurately represent the total population of child accidents. Accordingly, it is necessary to also analyse the mass data bases if valid generalisations are to be made. Of course, mass data interrogations also suffer from the same problem of a lack of causal data. The primary method of interrogation is correlational.

In this sub-section of the report it is the precipitating variables which are examined for key scenarios and various age and user groups. At the same time, every effort is made to determine whether or not differences exist between N.S.W. and Victoria, between metro and non-metro, between 1981 and 1982, and by degree of injury. Only those results of significance are included in the tables for any possible precipitating variable. The variables covered reflect those available and believed to be important from the prior literature review.

The mass data analysed involved

1981 National Fatal File
1981, 1982, and 1983 N.S.W. (TARU) Accident Files
1981 & 1982 Victoria (RTA) Accident Files

The variables examined vary according to their relevance to each of the main road user groups. The following section, which examines all road users as a total, does not include variables specific to particular road user groups; e.g. position in vehicle, which is included in the vehicle passenger subsection 4.32. Furthermore, section 4.31 is based on data from the National Fatal File and the Victorian data. The N.S.W. data was not obtained for all road users as a total.

4.31 All Child Accidents - All Road Users

4.311 Month of Year

Nationally, December produces the greatest number of fatalities largely because considerably more children are killed as vehicle passengers in December.

TABLE 51

CHILD ROAD FATALITIES 1981 AUSTRALIA
BY 3 MAIN* ROAD USER CATEGORIES

	Vehicle Passengers	Pedestrians	Bicycle	All Road Users
Base No.	148	134	66	382
	%	%	%	%
January	11	7	9	10
February	7	7	11	7
March	6	11	9	8
April	7	11	4	8
May	6	3	8	5
June	3	7	9	5
July	12	7	2	9
August	6	12	4	8
September	9	10	11	10
October	7	9	14	9
November	8	9	9	9
December	16	6	11	11
Total	100%	100%	100%	100%

Source: D.O.T., Fatal File, 1981.
* Motorcycle/pillion passengers and drivers excluded because bases too small but are included in total column.

Analysis of Victorian statistics across all road accidents suggests that there is little consistency between years, degree of injury, geographic location. The only notable exception, is for a slight peak to occur in December and January in country areas in Victoria.

4.312 Day of Week

At a national level, there is a tendency for child road fatalities to peak at weekends.

TABLE 52

CHILD ROAD FATALITIES 1981 AUSTRALIA
DAY OF WEEK BY ROAD USER CATEGORY

Day of Week	Pass.	Ped.	Bicycle	M'Bike	Driver	Total
Base No.	148	134	65*	21**	13**	381*
	%	%	%	%	%	%
Sunday	21	16	18	10	23	18
Monday	16	12	20	19	8	15
Tuesday	4	8	9	5	15	7
Wednesday	6	13	11	5	-	9
Thursday	9	22	8	5	23	14
Friday	15	15	20	19	8	16
Saturday	28	15	14	38	23	22
	100%	100%	100%	100%	100%	100%

Source: D.O.T., Fatal File, 1981.

* Base = 382 but 1 unknown day of week for a pedal cyclist (66 not 65).

** Caution small bases for motorbikes 5% = 1 person for driver 8% = 1 person.

In Victoria, in general, across 1981 and 1982, killed and injured, metro and non-metro the weekends accounted for disproportionally more child accidents than would be expected if all days contributed equally. Fridays were also likely to be more dangerous than other week days.

4.313 Time of Day

Nationally, child road deaths are most likely to occur between 2 p.m. and 8 p.m. 51% occurred in this 6 hour period. 4 p.m. to 6 p.m. is the peak period for child road deaths. However 2-4 p.m. and 6 to 8 p.m. are also important times.

TABLE 53

CHILD ROAD FATALITIES 1981 AUSTRALIA
BY 3 MAIN ROAD USER CATEGORIES

Time of Day	Passengers	Pedestrians	Bicycle	All Road Users
Base No.	148	134	66	382
	%	%	%	%
12 Noon - 2p.m.	6	8	14	8
2 - 4 p.m.	14	25	18	18
4 - 6 p.m.	11	23	29	19
6 - 8 p.m.	11	18	12	14
8 - 10 p.m.	7	5	3	6
10 - 12 p.m.	12	4	-	7
12p.m. - 2 a.m.	5	1	1	3
2 - 4 a.m.	7	2	-	3
4 - 6 a.m.	3	-	-	1
6 - 8 a.m.	5	1	5	3
8 - 10 a.m.	7	8	12	8
10 a.m. - 12 Noon	12	7	6	9
Total	100%	100%	100%	100%

Source: D.O.T., Fatal File, 1981.

Analysis of the Victorian data, by each single hour, reveals that across 1981 and 1982, metro and non-metro, fatal and non fatal, the peak two hours are not 4 to 6 p.m. but 3 to 5 p.m. which accounts for over 25% of child road accidents. Thus, the most dangerous hours are between 3 and 6 p.m. and especially 3 to 5 p.m. In this 3 hours period 1 in every 3 road accidents involving a child occur.

TABLE 54

ROAD ACCIDENTS VICTORIA 0-16 years

Percentage Between 3-5 p.m.

	1981	1982
Metro	25.8%	26.6%
Country	25.9%	25.7%

Percentage Between 5-6 p.m.

	1981	1982
Metro	11.1%	10.8%
Country	9.3%	10.2%

Source: RTA (Vic.)

4.314 Years of Driving Experience

Novice drivers are involved disproportionally in road accidents involving children 0-16. This is true in both the non-metro and in the metro areas and, as will be shown in section (4.328), is especially true of male drivers involved in child passenger accidents.

TABLE 55

ALL ROAD ACCIDENTS INVOLVING CHILDREN 0-16
VICTORIAN DRIVER EXPERIENCE IN YEARS 1981/82
Numbers

Years of Driving Experience	Metro 81	Metro 82	Non-Metro 81	Non-Metro 82
Under 1 year	201	179	106	83
1 - 2 years	129	130	38	55
2 - 3 years	124	99	28	30
3 - 4 years	101	97	23	27
4 - 5 years	70	79	19	30
Total 0-5 years	625	584	214	225
5-9 years	382	367	103	125
10 or more years	788	771	402	386
Unknown/Other*	335	385	236	217
Total	2130	2107	955	953

Source: RTA (Vic.).
* i.e. no motor vehicle involved in the child accident.

The same picture emerges if the data base is fatal accidents as in Table 56. The incidence of "first year" drivers being involved in child accidents, and especially accidents involving a child fatality, was disproportionally high, especially in 1982 in non-metro Victoria.

TABLE 56

FATAL ROAD ACCIDENTS INVOLVING CHILDREN 0-16
VICTORIAN DRIVER EXPERIENCE IN YEARS 1981/82

	Numbers Metro 81	82	Non-Metro 81	82
Under 1 year	8	6	4	7
1-2 years	4	2	1	2
2-3 years	5	5	1	-
3-4 years	4	2	3	-
4-5 years	1	3	1	3
Total 0-5 years	22	18	10	12
5-9 years	8	7	4	3
10 or more years	27	15	12	10
Unknown/Other	7	8	13	9
Total	64	48	39	34

Source: RTA (Vic.)

At the time of writing the incidence of novice drivers involved in "any" reported road accidents was not available to the authors. The argument still holds irrespective of whether or not novice drivers are disproportionally involved in accidents where children are not present.

4.315 Status of Driver Licence Holder

The over-involvement of novice drivers is also evidenced from analysis of licence status of drivers involved in accidents in which children 0-16 are involved. Two thirds of drivers involved in child accidents in Victoria have a standard drivers licence.

TABLE 57 TYPE OF LICENCE HELD BY DRIVERS INVOLVED IN CHILD ROAD ACCIDENTS IN VICTORIA 1981 - 1982 All Accidents

	1981				1982			
	Metro		Non-Metro		Metro		Non-Metro	
	Fat.*	Acc.**	Fat.	Acc.	Fat.	Acc.	Fat.	Acc.
Learner	1	17	-	16	-	13	-	10
Probationary	17	399	4	170	12	369	5	166
Standard	42	1437	30	634	26	1418	26	645
Disqualified	-	3	-	4	1	7	-	2
Unlicensed	2	52	1	37	1	56	-	30
Unknown	1	165	3	47	7	168	2	45
Other	1	57	1	47	1	76	1	55
	64	2130	39	955	48	2107	34	953

Source: RTA (Vic.)
* Fat. refers to fatalities
** Acc. refers to all accidents.

According to TARU supplied data (Table 58) for N.S.W., approximately only 5% of male licence holders have a "provisional drivers licence" whilst 72% of males hold a standard class 1 licence. It can by hypothesised that probationary drivers in Victoria are also disproportionally involved in accidents involving children. The extent of such over involvement is greatest in the metro area if the accident involves a child fatality.

TABLE 58 NUMBERS OF LICENCE HOLDERS IN N.S.W. 1981-82

	1981		1982	
	Male	Female	Male	Female
Vehicle drivers Class 1	1,222,904	1,110,225	1,154,811	1,158,053
Classes 2-5	454,511	15,255	467,629	16,457
Motor cyclist	229,910	21,363	244,446	22,643
Provisional drivers	57,007	48,832	56,929	51,949
Provisional riders	6,122	525	5,032	398
All licences*	1,894,231	1,197,492	1,951,957	1,250,766
	3,091,723		3,202,723	

Source: TARU (N.S.W.)
* includes taxis, class 7; class 8 & 9.

N.S.W. has a sizeable problem of accidents involving child drivers (under 17 years of age). Most of these children, who are involved in accidents involving themselves and/or other children (0-16), are unlicensed. Furthermore, the number of unlicensed drivers under 17 years of age in N.S.W. is substantial if all accidents are accounted for (table 59).

TABLE 59

STATUS OF DRIVERS UNDER 17 YEARS INVOLVED IN CRASHES IN N.S.W. 1981-1982
All Accidents*

	1981				1982			
	Metro		Non-Metro		Metro		Non-Metro	
	Cars	Motor Cycle	Cars	Motor Cycle	Cars	Motor Cycle	Cars	Motor Cycle
Learner	47	37	33	52	25	39	29	49
Provisional	2	1	4	-	3	3	4	2
Standard	2	-	-	1	3	-	-	-
Expired	-	-	-	-	-	-	-	-
Unlicensed	146	60	56	51	141	55	69	66
Unknown	6	2	11	1	4	1	1	-
Total	203	100	104	105	176	98	103	117

Source: TARU (N.S.W.)
* Excludes vehicles defined as 'other' i.e. not car or car derivatives.

4.316 Alcohol Involvement

Data relating to alcohol involvement varies as to its reliability between the various states. At a National level in 1981, of the 382 child deaths on the road, alcohol was known to be present in over 10% of the child fatalities. It is conceivable that the real incidence was higher.

Table 60 reveals that alcohol has its greatest impact in road accidents upon children as occupants and second only on children as pedestrians.

TABLE 60

ALCOHOL INVOLVEMENT IN CHILD ROAD DEATHS - 1981

	Total	No Alcohol	Under .05	Over .05	Unknown
Deceased					
pedestrians	134	87	1	12	34
cyclists/pillion passengers	66	52	1	2	11
motor cyclist/ pillion passengers	21	18	-	-	3
driver/car etc.	13	5	1	1	6
passengers	148	62	5	21	60
Total	382	224	8	36	114

Source: D.O.T. Fatal File, 1981.

Victorian data reveals that alcohol is involved in a sizeable number of road accidents involving children, although, in most instances, the level of alcohol involvement is below the prescribed limit. Alcohol is involved in over a quarter of child road accidents in the non-metro and around one fifth of these occurring in the metro area. Mostly, the alcohol involvement does not exceed the prescribed legal limit.

TABLE 61

BLOOD ALCOHOL CONTENT OF DRIVERS INVOLVED IN CHILD ROAD ACCIDENTS IN VICTORIA 1981-1982

	1981		1982	
	Metro	Country	Metro	Country
All Accidents				
B.A.C. under .05	345	223	379	209
B.A.C. .05 and above	30	33	37	51
Other*	1755	699	169	693
	2130	955	2107	953
Fatalities				
B.A.C. under .05	12	11	11	6
B.A.C. .05 and above	0	3	1	0
Other*	52	25	36	28
	64	39	48	34

Source: RTA (Vic.)
* Includes accidents with no alcohol and no driver involvement.

4.317 Weather Conditions

Analysis of the fatal file for child road deaths nationally for 1981 reveals that bad weather conditions are present for some child road deaths but in less than 10% of cases.

TABLE 62

CHILD ROAD DEATHS, 1981 (0-16 Years)
ROAD-USER TYPE OF DECEASED AND WEATHER CONDITIONS AT TIME OF ACCIDENT

	Row Total	WEATHER CONDITIONS Unknown	Fine	Rain	Fog/Mist
Column Total	382	3	355	21	1
Type of Road User					
Driver					
Car/Truck/Van	13	-	12	1	-
Pedestrian	134	1	128	5	-
Pedal Cycle					
Rider/Pillion	66	1	61	4	-
Motor Cycle					
Rider/Pillion	21	-	21	-	-
Passenger					
Car/Van/Truck	148	1	133	11	1

Source: D.O.T., Fatal File, 1981.

4.318 Type of Road

Data relating to type of road is not easy to interpret. An attempt is made in section 4.4 to look at location in more detail. Data from the fatal file for 1981 indicates that in metro areas most child fatalities occur on local streets (class 8 and class 9 of functional classification of roads).

TABLE 63

LOCATION OF FATAL ACCIDENTS AUSTRALIA 1981

(Percentages)

Road Hierarchy	All Ages	0-16	Passengers	Other
(a) Non Urban				
Class 1	>1	-	-	-
2	11	6	12	2
3	15	13	23	6
4	22	19	27	14
5	7	7	7	7
(b) Urban				
6 Arterial Roads	1	2	2	2
7 Collector Roads	14	11	10	12
8 Local Streets	18	18	14	21
9 Specific purpose roads/streets	12	22	5	32
10 Unknown	>1	2	>1	3
	100%	100%	100%	100%

Source: D.O.T., Fatal File, 1981.

Another road classification system lends weight to the importance of local streets as a major source of road fatalities in urban areas for all but car passengers.

TABLE 63

LOCATION OF FATAL ACCIDENTS INVOLVING CHILDREN 0-16 AUSTRALIA 1981

(Percentages)

Road Class	All 0-16	Vehicle Passengers	Drivers/cycle/pedestrians/pillion
	%	%	%
Not urban road	45	70	30
National highway	5	5	4
State highway	5	4	6
Freeway/tollway	>1	-	1
Arterial/sub-arterial	16	11	19
Commercial/residential	28	10	39
Other	>1	-	1
	100%	100%	100%

Source: D.O.T., Fatal File, 1981.

In an effort to get closer to the child road accidents which occur in metropolitan areas each accident involving a fatality with a child 0-16 in Sydney 1981 and 1982 was plotted on a map and coded in terms roads with "traffic movement" functions versus roads with "access" functions in line with the distinction made in the Department of Transport Australia publication "Town Planning and Road Safety".

Each fatal was plotted on a UBD Sydney Region map showing industrial and commercial areas and used the DMR classification system as recorded on the accident record. The data is reasonably precise with respect to location. The following codes were used.

Code	DMR Type	ORS Type
1	Freeway	Traffic Movement Function
2	State Highways	" " "
3	Main Road	" " "
4	Secondary Road	Access Function
5	Other Trafficable roads	" "
6	Main Traffic Route	Traffic Movement Function

Additionally, each location was classified as residential or commercial or industrial. Only Sydney Metropolitan area fatalities were included in the analysis. The results appear in Table 64.

The data in Table 64 suggests that local roads are the most likely venue for a fatal accident involving a child. It also suggests that pedestrian accidents whilst they occur in local streets, do occur in streets with a traffic movement function. Andreassend et.al. 1984 in a footnote, point out in their analysis of pedestrian accidents, that accidents on a particular road class were viewed as consisting of all the link accidents, for that class plus all the intersection accidents involving a road of that class with roads of either the same class or of a lower hierarchy. This suggests that local streets etc may get subsumed under higher priority categorisations.

TABLE 64

N.S.W. CHILD FATALITIES 1981-82
BY LOCATION OF ACCIDENT
(Numbers)

Code	Type of Road	Cyclists	Pedestrians	Vehicle Pass.	All Road Users
2	State highway	-	6	2	8
3	Main road	2	9	12	23
4	Secondary road	-	6	1	7
5	Other trafficable roads	11	15	5	31
6	Main traffic route	4	30	7	41
	Residential	15	46	17	78
	Commercial	2	15	1	18
	Industrial	-	4	7	11

Source: TARU provided data.

4.319 Purpose of Trip

This aspect of the analysis ought to prove most useful. Unfortunately accident reports are frequently left incomplete with respect to this question.

TABLE 65

PURPOSE OF TRIP FOR
CHILDREN 0-16 KILLED ON
AUSTRALIA ROADS 1981
By Type of Road User

Purpose	Pedestrians	Passengers	Cycle*	Motor Cycle*	Driver	Total
Work	1	8	-	1	3	13
Home	19	21	8	-	-	48
Shopping	9	2	1	1	-	13
Recreation	13	16	10	3	3	45
Friends	6	21	4	2	2	35
Hotel	3	10	-	2	1	16
School	11	3	3	-	-	17
Unknown	60	49	38	10	4	161
Other	12	18	2	2	-	34
	134	148	66	21	13	382

Source: D.O.T., Fatal File 1981.
*. Includes pillion passengers.

Analysis of case records also revealed a high level of "purpose unknown". Again, this supports the suggestion in section 4.14 for better accident reporting procedures.

4.32 Vehicle Passengers

4.321 Month of Year

For all vehicle passenger accidents involving children 0-16 years of age there is very little consistency over time, between States, metro versus country. The following generalisations can be made:

- January and December are likely to be peak months but are not always so.
- The higher incidences in January and December are more pronounced in country areas.
- May is also likely to be a peak month.
- September is a peak month in Victoria and was a peak month in N.S.W. in 1983.

Analysis of specific scenario groups reveals similar patterns to above. Although, a small sample base, children 5-7 without restraint also have a peak in June.

4.322 Day of Week

Child passenger accidents 0-16 years of age increase from Thursday to a peak on Saturday with Sunday accounting for almost, or as many as Saturday. This pattern applies to metro, non-metro; fatals, non-fatals; 1981-83; N.S.W. and Victoria.

Variations by scenario groups suggest that the size of the weekend peak increases with the increasing age group of the children. This applies across both metro and non-metro areas.

4.323 Time of Day

The peak time for child passenger accidents is afternoons. In the metropolitan area, the incidence increases substantially from 3 p.m. to 8 p.m. with a slight peak at 4-6 p.m. In the country, the numbers increase from 1 p.m. or 2 p.m. until 7 p.m. with a slight peak at 3 p.m. to 5 p.m.

Whilst these peak times occur in the afternoon there is also a smaller mid morning peak 10 - 11 a.m. in Victoria but not in N.S.W. where the numbers remain higher than early morning until the afternoon rise.

For the 5-7 year olds, not wearing a restraint, the peak between 4-6 p.m. is quite marked. For the 8-12 year olds, there is almost no peak so that their accidents are almost equally spread across all hours of daylight up to 8 p.m. For the teenagers 13-16 years, there is no peak. Unlike other age groups, this age group are involved in sizeable numbers in accidents up till 1 a.m.

4.324 Position in Vehicle

On a national basis for 1981, according to the Fatal File, 26% of children 0-16 killed as occupants were seated in the left front seat. The incidence of being in the left front seat was 40% for the teenage group (13-16 years). For all road passenger fatalities (all ages) the left front seat accounted for 60% of occupant deaths.

Examination of child casualties in passenger accidents in which a fatality (any age) occurred reveal that the left front seat accounted for 24% of casualties to 0-16 year olds and 37% of casualties to 13-16 year olds, and 52% of casualties to all ages.

Analysis of all child passenger accidents in N.S.W. and Victoria reveals that approximately one quarter (in Victoria) and one third (in N.S.W.) of child passenger casualties involve a child in the left front seat. However, this seat accounts for a greater proportion of child fatalities. In N.S.W. there is a slight tendency for a greater proportion of child passenger accidents in the metropolitan area to involve a child in the left front seat.

Across the two states, over time, and by metro and non-metro areas the next most frequently used seats involving child passenger accidents are left rear and right rear in that order.

In very few of the total number of accidents were child drivers (usually 13-16) injured. However, across all the accidents involving children 0-16 as passengers a sizeable number of drivers (17 years and older) were also injured or killed. In Victoria, drivers accounted for one quarter of all persons (all ages) injured or killed in accidents in which a child was involved as a passenger. However, drivers injured or killed as a proportion of accidents in which a child was injured or killed was of the order of 55% in the metro area and 35% in non-metro areas. Thus, where a child is injured or killed as an occupant there is a good chance that the driver will also be injured or killed in half of these accidents in the metro area, or one third of the non-metro accidents, at least in Victoria.

Analysis of scenario groups reveals that children aged 5-7 years injured or killed without a restraint were more likely to have been seated somewhere in the rear seat position. As the age of child increases so too does the proportion of children injured or killed seated in the left hand front seat. This applies across time, states, and metro versus non-metro.

4.325 Restraint Use

The data in this section is subject to considerable error. So much so that for a number of years Victoria ceased collecting the data. Accordingly, the generalisations for N.S.W. data ought to be regarded with some caution. More reliable data based on observation studies appears in section 8.41.

The incidence of accidents coded "child involved not wearing a seat belt" (excluding "unknown") is consistently related to severity of injury.

TABLE 66 N.S.W. Child Passenger Accidents - Child Involved "Not" Wearing Restraint

		Killed	Admitted	Other	Total
1981	Metro	36.8%	25.4%	24.3%	24.6%
	Non-metro	55.3%	32.3%	28.7%	30.7%
1982	Metro	40.0%	31.9%	19.7%	21.7%
	Non-metro	49.1%	35.7%	19.7%	26.5%
1983	Metro	40.0%	22.3%	19.9%	20.5%
	Non-metro	43.2%	31.3%	22.7%	25.9%

Source: TARU (N.S.W.)

The actual incidence of not wearing seat belts is most likely understated. However, it is less likely to be so with respect to fatalities. From the above data it seems reasonable to conclude:

- that wearing rates are lower in the country;
- that at least between 40-50% of children killed as passengers were not wearing a restraint;
- that the incidence of a child wearing a restraint increases as the severity of the injury decreases.

Child passenger injuries and fatalities are most likely (65%) to involve children over the age of 8 years. Analysis of the two oldest age scenarios reveals that seat belt non-wearing rates were low in both age groups in metro and non-metro.

TABLE 67 N.S.W. Child Passenger Accidents 1981-82 Combined

Percentage Not Wearing of Seat Belt

	Killed	Admitted	Other	All Passenger Accidents 0-16
8-12 years				
Metro	25%	27%	23%	23%
Non-metro	45%	29%	20%	24%
13-16 years				
Metro	40%	28%	20%	20%
Non-metro	55%	33%	26%	26%

Source: TARU (N.S.W.)

4.326 Geographic Area

Consistently more children are killed as passengers in the country than in the metropolitan areas yet almost twice as many accidents involving injuries or death to children occur in the metropolitan area.

In N.S.W., child passengers admitted to hospital are much higher in the country than the metropolitan area. This is not true for Victoria where metro hospitalisations only slightly exceed country hospitalisations.

TABLE 68 CHILD PASSENGER ACCIDENTS

		Killed	Admitted to Hospital	All Passenger Accidents
Vic. 81	Metro	16	276	705
	Country	25	233	359
Vic. 82	Metro	16	268	643
	Country	19	228	354
N.S.W. 81	Metro	19	276	1538
	Country	47	539	976
N.S.W. 82	Metro	20	204	1258
	Country	57	490	861
N.S.W. 83	Metro	20	188	1314
	Country	37	418	895

Sources: TARU (N.S.W.) RTA (Vic.)

4.327 Sobriety of Driver

Alcohol is present in a small but significant proportion of drivers involved in child passenger accidents:

TABLE 69 N.S.W. CHILD PASSENGER ACCIDENTS 1981-83
SOBRIETY OF DRIVER
(Percentages)

	Metro		Country	
	All	Fatals	All	Fatals
		1981		
Under .05	0.4	-	0.6	-
.05 and over	4.3	10.5	3.4	4.2
Unknown +	0.2	-	0.1	-
Opinion U.1.	0.1	-	0.8	2.1
		1982		
Under .05	1.1	5.0	0.5	1.8
.05 and over	3.8	10.0	4.1	8.8
Unknown +	0.1	-	0.3	1.8
Opinion U.1.	0.1	-	-	-
		1983		
Under .05	1.1	5.0	0.2	-
.05 and over	3.8	5.0	6.0	5.4
Unknown +	0.1	-	0.1	2.7
Opinion U.1.	-	-	0.1	-

Source: TARU (N.S.W.)

It is quite conceivable, however, that these figures could understate the level of alcohol involvement by drivers. Analysis of the 13-16 age group passenger accident data reveals a somewhat greater degree of alcohol involvement by drivers.

TABLE 70 PERCENTAGE OF ACCIDENTS INVOLVING VEHICLE PASSENGERS N.S.W. 13-16 years. IN WHICH ALCOHOL IS SUSPECTED IN DRIVER

		1981	1982
Metro	Killed	20.0%	20.0%
	All Accidents	8.0%	8.0%
Non-metro	Killed	11.8%	20.0%
	All Accidents	7.6%	9.8%

Source: TARU (N.S.W.)

4.328 Driver Experience/Licence Status

First year drivers in Victoria and N.S.W., country and metro, are more than twice as likely as any other single year group of drivers to be involved in passenger accidents involving children 0-16.

TABLE 71 INCIDENCE OF INEXPERIENCED DRIVERS INVOLVED IN CHILD PASSENGER ACCIDENTS
Years of Driver Experience
(Percentages)

Victoria 1981	1	2	3	4	5	1-5	6-10
Metro	11.9	6.7	5.7	4.7	2.9	31.9	18.8
Non-metro	13.0	5.0	2.6	2.3	1.6	24.5	9.8
Victoria 1982							
Metro	11.4	5.5	3.3	4.4	3.0	27.6	17.9
Non-metro	10.8	6.5	3.3	2.3	3.7	26.6	14.2
N.S.W. 1981							
Metro	14.1	6.7	6.0	4.6	2.2	33.6	16.7
Non-metro	13.3	5.5	6.5	3.3	2.8	31.4	11.7
N.S.W. 1982							
Metro	13.8	4.7	5.1	4.5	3.2	31.3	15.8
Non-metro	16.2	6.0	4.0	4.5	3.3	34.0	11.7
N.S.W. 1983							
Metro	13.1	5.0	3.9	6.0	3.8	31.8	14.0
Non-metro	10.6	3.5	5.8	3.9	3.6	27.4	13.0

Sources: TARU (N.S.W.) RTA (Vic.)

Table 71 shows how consistent the findings are regarding:

- the over-involvement of first year drivers;
- the dramatic reduction in involvement by drivers in their second five years of driving.

Analysis of mass accident data (Table 72) reveals that as the age of the child passenger increases so too does the years of driver experience increase from 10-19 years to 20-29 years reflecting the age of the parents. However, for the teenage passengers the reverse is true.

TABLE 72 Years of Driving Experience of Drivers Involved in Passenger Accidents in N.S.W. 1981-82.

	1981		1982	
	Metro	Non-metro	Metro	Non-metro
Passengers 0-4 years				
Driver experience				
under 1 year	6.8%	5.3%	5.0%	6.1%
1 year	2.2%	1.1%	1.5%	2.6%
10-19 years	38.6%	37.7%	40.4%	44.0%
20-29 years	7.2%	10.6%	9.4%	8.3%
Passengers 5-7 years				
Driver experience				
under 1 year	1.9%	6.8%	5.1%	2.9%
1 year	1.9%	6.8%	2.6%	2.9%
10-19 years	47.2%	44.1%	25.6%	54.3%
20-29 years	7.5%	10.7%	17.9%	11.4%
Passengers 8-12 years				
Driver experience				
under 1 year	5.2%	4.6%	6.1%	6.9%
1 year	2.9%	2.0%	2.5%	1.9%
10-19 years	35.6%	39.8%	37.5%	39.4%
20-29 years	20.4%	22.8%	20.3%	24.3%
Passengers 13-16 years				
Driver experience				
under 1 year	27.2%	25.2%	26.5%	32.2%
1 year	13.6%	10.8%	9.0%	11.9%
10-19 years	12.7%	12.7%	15.9%	10.2%
20-29 years	13.1%	14.6%	15.3%	12.8%

Source: TARU (N.S.W.)

In Victoria, non standard licence holders (i.e. learner, probationary, disqualified, and unlicensed) accounted for approximately 25% of child passenger accidents. This held for 1981 and 1982 and across metro and non-metro areas. In N.S.W., the equivalent figure is approximately 15%.

In Victoria, approximately 20% of child passenger accidents involve probationary drivers or learners. In N.S.W, the comparable figure is less than 15% classified as provisional or learners.

As with the "driver experience" data, there is a massive involvement of drivers with a learner/provisional license status in teenage (13-16 years) passenger accidents. Whereas, for younger children, the involvement of such drivers is quite low.

4.329 Location

The 'type' of road on which child passenger accidents occur vary considerably between metropolitan and country areas. In the metropolitan area half of the accidents occur on 'local roads'; another quarter occur on 'main roads', approximately 15% on State highways and less than 10% on secondary roads. Analysis of fatality data over three years in N.S.W however is not so consistent since local roads vary from 35% in 1982 to 63% in 1981 and 50% in 1983. The involvement of main roads in child passenger fatalities varies from 35% in 1983 to 50% in 1982 to 26% in 1981.

In country areas, State highways take on much more significance accounting for around 36% of all child passenger accidents (more than double the metro figures). Local roads account for one third of country accidents and main roads around 16%. The fatality data again shows great variation. State highways vary in significance from 64% of fatals in country N.S.W. in 1981 to 51% in 1982 to 38% in 1983.

Analysis of scenario groups reveals roughly consistent incidences by road type across the age groups. Where variations occur they are inconsistent across the years.

4.33 Pedestrians

4.331 Month of Year

Child pedestrian accidents are spread fairly evenly across all months of the year. Across the three years 1981-83, between states, and metro versus non-metro there is no consistent pattern suggesting that any one month is more significant than another. In some places, in some years, June and October have a slight peak.

4.332 Day of Week

Metropolitan child pedestrian accidents (viz., 80% of all child pedestrian accidents in N.S.W. & Victoria) peak on Thursday and Friday, around 18% on each of these two days, dropping off on Saturdays and with a low on Sundays (8%).

Analysis of the scenarios reveals that, apart from the late week peak, Saturdays are significant for all 0-4 year old pedestrians, male pedestrians 0-4 years of age, 2-4 year old pedestrians. For these three scenario groups Sunday is also important (but less so than Thursday and Saturday) and more important than for children over 4 years of age.

4.333 Time of Day

Child pedestrian accidents mostly occur between 3-6 p.m. These three hours account for around 50% of all the child pedestrian accidents. The peak is greatest between 3-4 p.m. in both metro and urban areas. In metro Victoria and N.S.W. there is also a significant but smaller peak between 8-9 a.m. This same peak is also present in non-metro N.S.W. but hardly evident in non-metro Victoria where a small peak occurs at 11-12 a.m.

Whilst overall the modal hour for pedestrian accidents is 3-4 p.m. this is not true for the youngest children. For the following scenarios the peak is 4-5 p.m.:

- Male pedestrians 0-4 years of age
- All pedestrians 0-4 years of age
- All pedestrians 0-2 years of age.

Male pedestrians 5-7 years of age and pedestrians 8-12 years of age have a marked peak between 3-4 p.m. across metro and country areas. The peak is also high from 4-6 p.m. It is these scenario groups who contribute to the 8-9 a.m. small peak.

Teenage pedestrians (13-16) exhibit a small morning peak 8-9 a.m. and a peak at 3-4 p.m. However, their afternoon peak is not as marked as the younger age groups.

4.334 Geographic Area

Child pedestrian accidents and fatalities are primarily a metropolitan area problem.

TABLE 73 — CHILD PEDESTRIAN ACCIDENTS

		Killed	Admitted to Hospital	All Pedestrian Accidents
Vic. 81	Metro	32	275	592
	Non-metro	6	52	104
Vic. 82	Metro	20	284	586
	Non-metro	8	69	124
N.S.W. 81	Metro	40	382	1257
	Non-metro	15	130	295
N.S.W. 82	Metro	38	329	1070
	Non-metro	13	139	309
N.S.W. 83	Metro	35	384	1223
	Non-mètro	13	119	283

Source: TARU (N.S.W.) RTA (Vic.)

4.335 Sobriety of Driver

Analysis of scenario statistics reveals that alcohol is not a factor in over 98% of child pedestrian accidents.

4.336 Driver Experience/Licence Status

First year drivers, and less experienced drivers, are over-represented but to only a small degree in comparison to child passenger accidents. The relevant statistics are summarised below for metro area only, since over 80% of pedestrian accidents occur in the metro areas in N.S.W. and Victoria.

TABLE 74 — INCIDENCE OF INEXPERIENCED DRIVERS INVOLVED IN CHILD PEDESTRIAN ACCIDENTS METROPOLITAN

Driver Experience

		1st Year	2nd Year	3rd Year	4th Year	5th Year	1st 5 Yrs.	2nd 5 Yrs.
Vic.	81	7.8	6.4	5.7	4.7	3.9	28.5	17.5
	82	5.5	6.7	5.6	4.8	5.5	28.1	18.0
N.S.W.	81	7.3	3.7	4.6	5.1	4.0	24.7	16.3
	82	6.0	4.0	4.8	4.9	5.0	24.7	18.2
	83	6.8	3.4	6.1	5.6	4.6	26.5	18.4

Sources: TARU (N.S.W.) RTA (Vic.)

Analysis of non-metro child pedestrian accidents also reveals a slightly higher incidence of involvement of first year drivers.

4.337 Location

Two thirds of metropolitan child pedestrian accidents occur on local roads; around 20% on main roads; 10% on State highways; and approximately 8% on secondary roads. The same pattern emerges for child pedestrians killed in the metro areas.

In non-metro areas, which in total only account for around 20% of child pedestrian accidents, local roads still account for between 50-60% of child pedestrian accidents whilst State highways are more significant than in the metro areas and account for between 15-25% of child pedestrian accidents.

The significance of local roads is considerably greater for younger children.

TABLE 75 INCIDENCE OF CHILD PEDESTRIAN ACCIDENTS ON LOCAL ROADS IN N.S.W.

	Metro		Non-metro	
Key Pedestrian Groups	81	82	81	82
0-4 years	88.5%	80.3%	64.1%	67.9%
Males 0-4 years	88.5%	81.8%	64.1%	66.7%
2-4 years	89.7%	81.3%	62.2%	68.4%
Males 5-7 years	74.2%	76.6%	53.1%	67.6%
8-12 years	55.9%	60.7%	46.6%	57.6%
13-16 years	51.1%	47.3%	52.2%	47.0%

Source: TARU (N.S.W.)

As children get older, proportionally more of them are involved as pedestrians in accidents related to main roads and state highways.

Analysis of pedestrian accidents in N.S.W., in terms of type of location, reveals that a large proportion occur mid-block. It must be noted that intersections are coded as such if a crash occurs within 10 metres of an intersection. Table 76 summarises the metro N.S.W. situation in 1981 and 1982.

Only one in every three child pedestrian accidents occur at intersections. T-Junction intersections appear to present the greatest hazard (probably reflecting exposure).

TABLE 76 LOCATION OF PEDESTRIAN ACCIDENTS IN N.S.W.

	1981 No.	1981 %	1982 No.	1982 %
Cross intersection	200	13.3	180	13.5
T-junction	318	21.1	269	20.1
Y-junction	9	0.6	6	0.4
All other intersection	2	.1	4	0.3
Sub-total intersections	**529**	**35.1**	**459**	**34.3**
Two way street	880	58.4	758	56.7
Divided Street	69	4.6	84	6.3
One way street	21	1.4	16	1.2
Other non-intersection	8	0.5	20	1.5
Sub total non-intersection	**978**	**64.9**	**878**	**65.7**
Total	1507	100	1337	100

Source: TARU (N.S.W.)

4.338 Manoeuvres

Running is the most frequently (over 55%) nominated manoeuvre involved in child pedestrian accidents. However, a sizeable proportion of children are walking when struck down. Not all pedestrians are on the roadway when they are involved in an accident. This applies especially to very young children.

TABLE 77 MANOEUVRES OF PEDESTRIANS INVOLVED IN ROAD ACCIDENTS IN N.S.W.

Pedestrian Manoeuvre	1981	1982
Running across road	861	815
Walking across road	516	379
On footpath	45	41
On edge of road walking with traffic	20	18
In/on toy on road	19	12
Stationary on road	18	18
Stepping off/onto kerb	17	25
Playing on roadway	11	14
On edge of road walking against traffic	5	7
Entering stationery vehicle	4	1
Stepping off/onto median strip	5	4
Entering moving vehicle	3	5
Working on roadway	2	-
Working on vehicle	1	1
Other	25	39
	1552	1379

Source: TARU (N.S.W.)

4.34 Pedal Cyclists

4.341 Month of Year

There is little consistency across the two states, over the 2-3 years, or metro versus non-metro except that, proportionately more pedal cyclist accidents occur in the warmer months from October - April and more particularly November - March inclusive. If any one month is a peak, it is most likely to be March, but it is not always so over time or place.

Analysis of the two key scenario groups, males 8-12 and males 13-16, reveal that non-metro pedal cycle accidents amongst 8-12 year old boys have a May peak. For 13-16 year olds there is no prevailing pattern, except for the bias towards warmer months.

4.342 Day of Week

Analysis of Victorian and N.S.W. pedal cycle accidents over 1981 and 1982 reveals no consistent pattern so that it appears each day of the week contributes its share of accidents. Sunday consistently provides the least accidents. This flies in the face of hospital pedal cycle accident data (see section 5.5).

Analysis of the two key male scenario groups also reveals a number of peak days but these vary between 1981 and 1982 and between metro and non-metro. No consistent pattern exists.

4.343 Time of Day

Pedal cycle accidents are much more likely to occur between 3-6 p.m. with a peak between 4-5 p.m. Almost half the pedal cycle accidents occur in the three hours between 3-6 p.m. A smaller peak occurs between 8-9 a.m. The overall pattern occurs amongst the two key male scenario age groups.

4.344 Geographic Area

Whilst more pedal cycle accidents occur in the metro area, the relationship of accidents is more closely related to population incidence than are pedestrian accidents.

TABLE 78 CHILD PEDAL CYCLE ACCIDENTS

		Killed	Admitted to Hospital	All Pedal Cycle Accidents
Vic. 81	Metro	14	199	490
	Non-metro	8	85	193
Vic. 82	Metro	10	200	534
	Non-metro	7	84	189
N.S.W. 81	Metro	10	117	588
	Non-metro	4	104	274
N.S.W. 82	Metro	7	157	637
	Non-metro	3	93	273
N.S.W. 83	Metro	10	151	696
	Non-metro	5	101	300

Sources: TARU (N.S.W.) RTA (Vic.)

4.345 Sobriety of Driver

A sizeable number of pedal cycle accidents do not involve a motorised vehicle. Where a motorised vehicle is involved, the incidence of drivers with measurable blood alcohol concentrates is less than 1%. One noticeable feature of the N.S.W. statistics is the magnitude (approximately 10%) of those coded 'opinion sober'.

4.346 Experience of Driver

Novice drivers are involved disproportionately in accidents with pedal cyclists but not to the same extent as in passenger accidents.

TABLE 79 INCIDENCE OF INEXPERIENCED DRIVERS INVOLVED IN PEDAL CYCLE ACCIDENTS

		Driver Experience						
		1st Year	2nd Year	3rd Year	4th Year	5th Year	1st 5 Yrs.	2nd 5 Yrs.
Vic. 1981	Metro	7.9	4.0	6.1	5.1	2.2	25.3	15.9
	Non-metro	8.8	1.0	2.1	3.6	3.1	18.6	11.9
Vic. 1982	Metro	7.5	6.9	6.0	4.7	3.4	28.5	15.8
	Non-metro	3.2	4.8	3.2	2.1	1.6	14.9	12.7
N.S.W. 1981	Metro	8.2	3.4	4.9	5.3	3.4	25.2	15.1
	Non-metro	5.8	5.1	4.7	6.2	5.5	27.3	15.4
N.S.W. 1982	Metro	6.1	3.8	4.2	3.9	3.8	21.8	13.9
	Non-metro	8.4	3.7	4.8	2.9	2.6	22.4	14.3
N.S.W. 1983	Metro	6.0	4.3	5.0	5.2	3.2	23.7	14.0
	Non-metro	5.0	5.0	3.3	5.0	3.3	21.6	18.0

Source: TARU (N.S.W.) RTA (Vic.)

Analysis of the two key (male) pedal cyclist scenarios suggests that 1st year drivers are considerably more likely to be involved in these accidents than the second year drivers. Less experienced drivers as a whole are more likely to be involved in child 0-16 pedal cycle accidents.

In Victoria, a sizeable number of learner probationary drivers are involved in pedal cycle accidents (18% metro and 13% country). In N.S.W. the incidence of learner/provisional drivers is much lower (7%) but these differences are likely to be related to the relative sizes of those drivers classified as unknown.

In N.S.W. males 8-12 years of age who are more likely to be involved with a motorist who has a learner/provisional licence, than those aged 13-16 years.

4.347 Location

In N.S.W., local roads account for the majority of child pedal cycle accidents. In the metro area they account for 75% of accidents. In the non-metro area, the figure ranges from 63% to 72%. Main roads account for approximately 14% in the metro area and around 12% in the non-metro areas. State highways account for around 16% of pedal cycle accidents in the non-metro areas.

The younger boys, 8-12 years, are even more likely to have their pedal cycle accidents on local streets (metro 80%, non-metro 70%). For the teenage boys, in the metro area 60-69% occur on local roads and 20-25% in main roads.

Intersections account for approximately half the pedal cycle accidents in N.S.W. and this applies to both the metro as well as the non-metro area.

TABLE 80 LOCATION OF PEDAL CYCLE ACCIDENTS IN N.S.W.

	1981		1982	
	Metro	Non-metro	Metro	Non-metro
	No.	No.	No.	No.
Cross intersection	108	56	104	66
T-junction	174	70	220	57
Y-junction	6	0	2	1
All other intersections	3	1	4	1
Sub-Total intersections	291	127	330	125
Two-way street	260	139	234	132
Divided Street	18	3	32	2
One way street	2	1	2	2
Other non-intersection	3	-	13	1
Sub Total non-intersection	283	143	281	137
Total	574	271	611	262

Source: TARU (N.S.W.)

4.348 Manoeuvres

Unfortunately, approximately 60% of pedal cycle accidents in N.S.W. are classified in the accident records as moving along the roadway (code 12) which encompasses "proceeding along lane" (on either straight or curved road or at an intersection). Analysis of the remainder is also not very instructive. The next most frequent category is (Turn-26) "Performing other/unspecified forward manoeuvre".

A list of the most frequent manoeuvres in the N.S.W. accident data follows in table 81.

TABLE 81 MOST FREQUENT* BICYCLE MANOEUVRES INVOLVED IN ACCIDENTS IN N.S.W.

		1981	1982
(Move 12)	Proceeding along lane	61.4	56.2
(Turn 29)	Unspecified forward	8.6	15.1
(Turn 21)	Turn right out of own lane into road/drive	8.1	7.8
(Turn 26)	Enter road from drive	6.5	5.7
(Move 17)	Travelling wrong side of road	5.2	5.5
(Move 11)	Pulling out from kerb	1.9	1.3
(Turn 28)	Performing U-turn	1.9	>1
(Move 13)	Veering to right to change lane	1.6	1.4
(Turn 23)	Turn left out of own lane into road/drive	1.6	1.0
(Turn 38)	Moving along footpath	>1	2.3

Source: TARU (N.S.W.)
*Includes all manoeuvres accounting for more than 1% of accidents.

4.35 Motor Cycle and Pillion Passengers

No attempt will be made to analyse this road user category in any detail because of the small sample base. Data was obtained for N.S.W. only, where 12 children died in 1981, and 8 in 1982 and 1983 respectively as drivers. The total number of children involved in accidents as drivers or pillion passengers was approximately 250 in each year. Drivers were divided equally between metro and non-metro whilst pillion passengers were slightly more numerous in the metro area in N.S.W.

Of the motorcycle riders aged 0-16 involved in accidents over 80% were males aged 13-16. Approximately 60% of the drivers had no licence and the remainder had a learners permit. For pillion passengers injured, only one third of drivers had a licence, the remainder were learners or unlicensed. For one third of the drivers, the motorcycles used were not registered. For pillion passengers, the incidence of unregistered vehicles was much lower (around 20%).

The incidence of not wearing safety helmets was approximately 20% for riders and pillion passengers alike.

Approximately 70% of the accidents occur on local roads, 55% occur on straight roads on two way streets and 40% at intersections. 80% occur proceeding down a road or at an intersection (i.e. Move 12 code).

4.36 Summary of Mass Data Analyses

Any attempt to summarise the material in section 4.3 could not do justice to the mass of data provided. Accordingly, a schematic diagram (Figure E) has been included in the hope that the reader will seek out the details in the relevant sub-sections.

FIGURE E SCHEMATIC SUMMARY OF MASS DATA ANALYSES

Variable		All Road Users	Vehicle Passengers	Pedestrians	Pedal Cyclists
Month		---- No consistent pattern ----			
Day		Frid. Sat/Sun	Thurs - Sun	Thurs Frid/Sat	All Days
Time	Peak	3-5/4-6	3-8 Metro/	3-4	4-5
	Others	2-4/4-8	1-7 Non-Met	3-6/4-5	3-6
Weather		---- Bad Weather in less than 10% ---			
Driver Experience		---- Over-representation of novice drivers most especially in vehicle passenger accidents. ----			
Alcohol		---- present in over 10% of fatals more so in non-metro ----			
			high in teen pass. acc.	low 2%	low 1%
Type of Road		Local Streets	50% local Metro, Non-metro highways	2/3rds local Sts mid block	60-70% local inter sect-ions
Geography			Metro more accidents Non-metro more fatals.	Metro	Metro
Other			left front passenger and driver injured restraints not used.		