



# SAFETY OF OLDER DRIVERS

## Strategy for Future Research and Action Initiatives

by  
Brian Fildes

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**Abstract:**

The number of older driver crashes is not currently a major road safety problem in Australia, although these road users are over-represented in severe injury outcome rates. Moreover, with population and mobility changes expected over the next 30 or 40 years, the older driver problem is likely to increase substantially without intervention. A review was undertaken of existing literature reviews, other published and unpublished literature and other sources to identify what are the key older driver issues, what is currently known and unknown about older driver safety, and areas requiring further research and safety management. This was done to help government agencies and other organisations adopt a strategic approach to older road user safety in the years ahead. The review identified a number of key health, licensing and mobility issues relevant to older drivers and a number of research and management topics requiring further consideration. An expert group was formed comprising local and overseas specialists from government agencies, community groups and research organisations to help prioritise future efforts. Research issues of high priority included monitoring of crashes involving older drivers; the ability of older people to self-regulate their driving behaviour; the development of adequate screening tests for older drivers; the role of highway design for older drivers; older drivers as a cause of crashes; and the collection of comprehensive exposure data on older drivers' road usage. Management priorities included improved guidelines for licence referral; establishment of a pilot re-licensing program similar to that proposed by the National Highway and Traffic Safety Administration in the USA; a handbook that provides advice and recommendations on retiring from driving; provision of a manual on highway design for older drivers; an older driver handbook; and improvement in labelling medicine for older people that adversely affects driving ability. Collaboration with overseas efforts was also recommended to maximise the benefits from future research and management initiatives.

**Key Words:**

Drivers, elderly, health conditions, mobility, licensing, fitness to drive, testing, research, management, countermeasures

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## EXECUTIVE SUMMARY

### INTRODUCTION

Crash statistics show that while the number of older driver crashes is relatively few, as a road user group they do tend to be over-represented in fatal and serious injury crash rates. This seems to stem from a number of factors, including their frailty and age-related declines in health, vision, hearing, mobility and cognitive functioning. With expected "greying" of the population and an increase in mobility among older people, this road safety problem is likely to get worse in the years ahead without intervention.

### PROJECT OBJECTIVES AND PURPOSE

This older driver review was undertaken to address three major objectives.

1. To undertake a state-of-the-art review of current knowledge and practice relating to older drivers.
2. To develop an older driver research strategy, highlighting areas where there are gaps in present day knowledge or issues that need further resolution and to prioritise these needs.
3. To outline a management system for older drivers incorporating current or known relevant countermeasures for older drivers in terms of short-, medium- and longer-term priorities.

This strategy document is aimed at road safety researchers and practitioners and is intended to be of benefit in helping identify programs and future initiatives to reduce older driver trauma. It attempts to address questions relevant to "Safety First" as well as to identify new areas of relevance to older driver safety. It is hoped that this document will assist in setting the stage for future research and countermeasure initiatives aimed at reducing injuries to these vulnerable road users.

### REVIEW PROCESS

The review set out to examine a number of key documents and papers as there have been several comprehensive excellent literature reviews conducted recently and selected specialist journal editions. It aimed to provide a condensed discussion of the relevant issues and findings to date with emphasis on current research and management needs and developments.

Comprehensive materials were provided by local and overseas agencies and research organisations and discussions were held with key local and overseas organisations. A one-half day workshop was held in Sydney in November 1996 involving state and federal government authorities, community representatives and researchers to identify current and future plans in older safety initiatives across Australia. Dr. John Eberhard of the National Highway Traffic Safety Administration was invited to Australia to have direct input into the review process. Finally, an expert group was formed including local and overseas key government, community and research organisations to help set priorities for future research and management needs. This review only addresses issues of relevance to older drivers and a separate document will be available for older pedestrians.

## **OLDER DRIVER CRASHES**

Crashes involving people aged 65 years and older account for only 5.7% of all casualty crashes in Victoria but 7% of those involving serious injury and 9% of fatalities. From Australian police and coronial service reports, there is a suggestion that older people are more likely to have been at fault in a fatal crash but the evidence is less clear for all crashes.

Older drivers are more likely than younger drivers to crash during daylight hours and on dry roads, be under the legal BAC limit, more likely to crash at an intersection and to have been performing a complex traffic manoeuvres at the time of their collision.

Current predictions are that over the next 30 to 40 years, the proportion of people aged 65 years or older will double in Australia. Moreover, as the next generation of older drivers have higher licensing rates and are more mobile, the older driver problem is likely to get much worse in the years ahead without interventions to reduce these crashes.

## **OLDER DRIVER HEALTH ISSUES**

The ageing process ensures that older people are generally more frail and less healthy than younger adults and suffer a range of degenerative conditions. A number of age related health conditions appear to lead to some increase in crash risk during driving but the extent and degree of increase in risk is still somewhat contentious. The conditions which seem to have been associated with an increase in risk from the literature are:

- losses in dynamic visual acuity;
- degraded useful field of view;
- reductions in cognitive processing ability;
- dementia, especially Alzheimer's disease, stages 2 and 3;
- some cardiovascular conditions and possible chronic pulmonary disease;
- cerebrovascular accidents (CVA) and transient ischaemic attacks (TIA);
- insulin-dependent hypoglycaemia; and
- possible severe arthritis.

It should be stressed though that the evidence of crash association from many of these studies is not always conclusive and the mechanisms not well understood. Moreover, the threshold levels where performance is severely degraded varies, across individuals and medication can often reduce the risk for some of these disorders. Furthermore, the extent to which drivers with these conditions self-regulate their driving will also influence their crash involvement.

## **RE-LICENSING ISSUES**

Current licensing practices for older drivers vary from state to state in Australia. The most severe requirements currently involve annual road, medical and vision tests for those aged 70 to 80 years and above while one Australian state (Victoria) has no special requirements at all for older drivers. Interestingly, past studies have shown that older driver fatality rates in Victoria have not been significantly different from other states, even after adjusting for differences in fatality rates between the states.

Licensing requirements in Europe are somewhat varied and are currently under review with the advent of the European Union and the push for a standard European licence. North

American requirements also vary from state to state. Current national initiatives are aimed at developing a consistent model driver screening procedure where entry involves referral from a range of official and social sources and the person is screened, their driving history is reviewed and on-road tests conducted where necessary before a person's licence is revoked.

It should be noted that current licensing tests in Australia and elsewhere are generally inadequate screening devices for older road users and there are a number of current research initiatives underway overseas and Victoria to develop suitable screening and on-road test instruments.

The degree to which older people self-regulate their driving according to their abilities and cease driving when they feel they are no longer able to drive safely is not clear. This is important for demonstrating the need to undertake expensive re-licence testing programs.

## **OTHER RELATED ISSUES**

It is important that the older driver issue be viewed as part of a wider need of access to safe and affordable mobility as a critical aspect for older persons maintaining their quality of life.

In today's society, licences are often necessary for a range of personal identification purposes and are often perceived to be a passport as a normal healthy member of society. Alternatives are clearly required to minimise the effects of losing one's licence.

Driving is important for older people to maintain their mobility and independence. There is evidence which shows that losing one's ability to drive is associated with increased depression and dependence on others. A range of alternative transport options for older people, both public and private, is essential to enable them to lead normal healthy lives without having to drive. Programs aimed at helping fit and healthy older people transporting those less able to drive is worth trialing in this state.

The processes leading to an individual ceasing to drive are not well understood and the processes by which older people maintain their mobility without driving need to be investigated further.

Highway design has traditionally focussed on generally fit and able adult drivers in specifying acceptable design criteria. Ageing deficits in vision and reaction time in particular are problems for the older driver and may well increase their risk on the road. Further research in this area is required and designs modified for this vulnerable road user group. It should be stressed that older driver improvements will also be a benefit for all road users.

In-vehicle safety features would seem to be especially worthy for frail older people to protect them in a crash. Research aimed at identifying suitable features for frail occupants is warranted including ways in which they might be promoted among the elderly.

A selection of information and training materials are important to provide advice to older people on various aspects of driving, stopping driving and alternative mobility options.

Fitness to drive manuals for professionals are also clearly needed. While there are some materials available already and others in preparation, it would be worth examining the relevance of these publications and additional requirements.

## FUTURE RESEARCH & ACTION PRIORITIES

An expert panel, comprising government and community agencies, researchers and overseas experts, was established to help set future research and management priorities in this state. Fifteen research items and 11 countermeasures initiatives were identified during the course of this review and these were independently assessed by each member of the expert panel in terms of their perceived importance for the future.

**Table 1 Summary of Future Research Items**

Overall Score	RESEARCH ITEM	Representative Group Priority			
		Government (n=9)	Community (n=2)	Research (n=5)	Overseas (n=6)
1.5	Continued monitoring of crashes	1	3	1	4
1.9	Self-regulation process	6	5	4	1
1.9	Develop suitable screening tests	2	12	5	5
2.0	Highway design for older drivers	4	2	8	3
2.1	Crash causation by older drivers	3	4	3	10
2.2	Collection of exposure data	5	8	7	8
2.3	Health & impairment risk analysis	7	9	9	2
2.3	Develop suitable driving tests	10	15	2	7
2.6	Alternative forms of transport	14	1	12	6
2.7	Raise health & impair. awareness	8	11	13	9
2.8	Intelligent safety technology	9	10	15	12
2.9	Older driver graduated licensing	13	13	6	14
3.0	Re-licensing costs & benefits	12	14	10	11
3.1	Analysis of crash rates	11	6	14	13
3.3	Driver-pedestrian risk trade-off	15	7	11	15

### Research Priorities

The six most important research topics averaged across all members of the expert panel were:

1. continued monitoring of crashes involving older drivers;
2. the ability of older people to self-regulate their driving behaviour;
3. the development of adequate screening tests for older drivers;
4. the suitability of highway design for older drivers;
5. older drivers as a cause of crashes; and
6. the collection of comprehensive exposure data on older drivers road usage.

There was high agreement across all groups of the importance in continuing to monitor crashes and the need to undertake more analysis of the role of older people in causing crashes. In addition, most groups saw a need to better understand the processes and extent by which older people self-regulate their driving behaviour and licensing practices. Government officials and researchers felt it was important to develop better screening (and driving) tests to determine older driver's abilities to continue to drive safely.

The need to consider older drivers much more in highway design was rated highly by many of the respondents. As pointed out in the review, traditional design manuals do not specifically take ageing disabilities into account in designing roads and roadside furniture.

There was considerable agreement in the top order priority expressed between the Australian and overseas representatives, showing that many of the problems identified in Australia are not particularly unique to this country. Collaborative research effort between Australia and overseas countries is warranted to optimise the use of scarce research resources in older driver research. Staging an international conference which specifically address older driver research needs and recent findings could also be advantageous for seeking out opportunities by which Australia could profitably participate in future research effort in this area.

### Action Priorities

The summary of action priorities is shown in Table 2 below.

**Table 2 Summary of Future Action (Countermeasure) Items**

Overall Score	ACTION ITEM	Representative Group Priority			
		Government (n=9)	Community (n=2)	Research (n=5)	Overseas (n=6)
1.8	Guidelines for licence referral	2	6	1	1
2.2	Pilot model re-licensing program	3	10	2	2
2.3	Older driver handbook	6	5	3	3
2.3	Retirement from driving handbook	4	7	4	6
2.4	Medication labelling improvement	5	3	7	5
2.4	Highway design manual (O.D.)	1	8	5	12
2.5	Alternative transport policy	7	1	9	8
2.7	Alternative transport manual	10	9	6	4
2.8	Health impairment scale	8	4	10	7
2.9	Innovative training course	11	2	11	10
3.0	Passive safety features in cars	9	11	8	9
3.4	Personal Identity Card feasibility	12	12	12	11

The six top priority action or management items for improved older driver safety identified by the respondents included:

1. improved guidelines for licence referral;
2. the establishment of a pilot model re-licensing program, similar to that proposed by the National Highway and Traffic Safety Administration in the USA;
3. preparation of an older driver handbook;
4. a handbook providing advice and recommendations on how to retire from driving;
5. improved medication labelling for drugs that adversely affect driving ability; and
6. provision of a manual on highway design for older drivers.

There was good agreement from the various government, research and overseas representatives for these top priority items. Community group priorities were quite different where they called for alternative transport policies, re-training courses and a health impairment scale. Government agencies particularly saw a real need for a highway design manual. As noted earlier, though, this may need to be preceded by a research program aimed at identifying some of these characteristics.

There was some divergence among the groups of need for more educational materials. This could be simply explained by a lack of knowledge by all participants about measures currently in progress (eg; there is an older driver handbook currently being developed by VicRoads that not all respondents would have been aware of). Conversely, it might also reflect some disenchantment with current materials available in this area.

Again, there was considerable agreement between local and overseas representatives on the top order priority, reflecting once again the similarity of problems and potential solutions that clearly exist worldwide in this area.

## **CONCLUSION**

This review of older driver issues has outlined a number of priority research and actions for future strategic initiatives aimed at improving older driver safety. Older driver safety will become more concerning over the coming years as the number of older drivers on the road starts to increase quite dramatically. It is recommended that many of these initiatives be included in future research and management programs and highlighted in setting road safety agendas in future state-wide strategic plans, such as "*Safety First*".

## **1.0 INTRODUCTION**

Older drivers as a group do not currently represent a major road safety problem in most Western societies, compared with other age groups such as the young. However, they are involved in significantly more serious injury and casualty crashes per head of population mainly due to their frailty. This is more fully addressed in a later section of this report.

Furthermore, as the proportion of older people in Australia is expected to roughly double over the next 40 years, older drivers are likely to become a more significant road safety problem in the years ahead. Hence, it is appropriate to examine the nature of older road user safety now and to develop a strategic approach to improving older road user safety in the years ahead.

Given previous research in this area, the Monash University Accident Research Centre was asked to undertake this review of the nature and extent of the older road user safety problem and to develop a strategy for future research and road safety management initiatives.

### **1.1 WHO ARE OLDER DRIVERS?**

It is important before commencing this review to address two questions of definition, namely what constitutes 'old' and which groups of drivers does this review address.

#### **1.1.1 Chronological Vs Functional Age**

Age is often described in the literature in terms of chronological or functional status. Chronological age is the easiest to define as it simply represents the number of years since birth. However, several papers have pointed out that years since birth can be misleading in terms of performance ability as humans of a similar mature age can differ substantially in terms of their performance abilities. Functional age is more relevant as this equates human ability in terms of a common performance level. However, functional age can only be determined after a comprehensive examination of an individual's abilities and hence is not a useful concept for categorising population quickly. For this purpose, chronological age categories tend to be widely used for studies such as this one and this practice has been adopted here as well.

What threshold level to set for old age is a second contentious issue in the literature. Some studies have chosen relatively early levels such as 55 years where there have been sound reasons to measure the onset of the ageing process. Others, such as those only interested in addressing the frailty issue have settled on a 70 to 75 year criterion. In general, 65 years (the traditional retiring age) has been most commonly accepted as the time when one enters the older age group and this seems to be a useful age threshold for this strategy review, too.

However, it should be stressed that many of the problems of ageing can commence much earlier than 65 while others might not be evident much before one enters his or her seventies.

### **1.1.2 Older Road Users**

Road users are traditionally divided into five main road user types, namely:

- drivers or other car occupants;
- pedestrians;
- motor cyclists;
- heavy vehicle road users (trucks, buses, etc); and
- bicyclists.

Older road users rarely ride motorcycles, bicycles or drive heavy vehicles and so most of the present older road user problems reported in the literature relate to older people as either car occupants (drivers and passengers) or pedestrians. It should also be pointed out that these two categories are also not exclusive as many car occupants are also pedestrians at some time as well. This review will concentrate on older drivers exclusively and a separate document will address the safety of older pedestrians (see MUARC Report No. 119).

## **1.2 PROJECT OBJECTIVES**

The project set out to address three major objectives:

1. To undertake a state-of-the-art review of current knowledge and practice relating to older drivers;
2. To develop an older driver research strategy, highlighting areas where there are gaps in present day knowledge or issues that need further resolution and to prioritise these needs; and
3. To outline improvements in the management of older driver safety consisting of current or known relevant countermeasures for older drivers and listing their priorities.

While the older driver strategy was developed as a Victorian initiative, many of the issues and directions may well apply across Australia and even internationally. Thus, areas where national or international co-ordination is warranted were to be highlighted.

## **1.3 PROJECT BENEFITS**

The strategy document is aimed at road safety researchers and practitioners. It should be of benefit in helping to identify programs aimed at reducing older driver trauma. It attempts to address questions relevant to "*Safety First*", the Victorian Government's road safety strategy, as well as identifying new areas of relevance to older driver safety. It is intended that this document will assist in setting the stage for future research and countermeasure initiatives aimed at reducing injuries to these vulnerable road users in this state as well as elsewhere.

## 1.4 DEVELOPING THE STRATEGY

The approach used in developing this strategy was along similar lines to that used in a previous review of research and countermeasure requirements in speeding (Fildes and Lee, 1994), namely:

- a literature review of relevant publications;
- meetings and discussions with experts in the USA and England;
- workshop involving other state representatives;
- consultation with a project advisory committee;
- development of a list of possible research and management needs and initiatives;
- prioritisation of future needs.

As there have been several comprehensive excellent literature reviews conducted recently (eg: Janke 1994; Ward et al 1994; Elliott, Elliott & Lysaght 1995; Oxley et al 1995; Packham & Silcock, 1995), this review set out to examine in detail a number of these key documents and papers as well as selected specialist journal editions such as *Human Factors*, 33(5), 1991 on "Safety and Mobility of Elderly Drivers" and the *Journal of the International Association of Traffic Safety Sciences*, 20(1) titled "Traffic Safety for Elderly Drivers". The review is intended to be a condensed discussion of the relevant issues and findings to date with emphasis on current research and management needs and developments. As noted earlier, this review focuses only on older drivers and a separate document is available for older pedestrians. The needs were separated into those requiring additional information (research needs) to those requiring new countermeasure or programs (management needs).

### 1.4.1 TRB Committee

The principal author was invited to join the Research Co-ordination and Integration subcommittee of the Safe Mobility of Older Person's committee by the Transportation Research Board, National Research Council, Washington DC, thanks to Dr. John Eberhard and Dr. Jim McKnight. The TRB and the National Highway Traffic Safety Administration have undertaken a similar, albeit more extensive, review of the research and development needs of older drivers and have provided considerable assistance and materials in the conduct of this review. These previous efforts have helped considerably in the conduct of this strategic study and their current endeavours in research and program development will be closely monitored in the years ahead for relevance for Australia.

A number of key publications are available on current developments in the US on older driver initiatives and research needs. Those interested are referred to TRB Circular 398, May 1992 on the research and development needs for maintaining the mobility of older drivers, the traffic safety plan for older persons, NHTSA, March 1993, and Safe Mobility for Senior Citizens by Dr. John Eberhard (1996) for a comprehensive review of US developments. This review has benefited greatly from the excellent work of the TRB, NHTSA and the Federal Highway Administration (FWA). The *Research and Development Needs Statement* published by the latter agency identified 16 major areas for concentrating their future effort and resources and was especially useful in preparing this report.

### **1.4.2 Expert Inputs**

A number of experts willingly agreed to assist with this review. First, a Project Advisory Committee was formed to advise on the review, comprising sponsors of the Centres (VicRoads, Victoria Police, Department of Justice, Transport Accident Commission, RACV Limited, Human Services Victoria) as well as other local government and university experts.

Members of the PAC were very helpful in the conduct of the review and are listed in the acknowledgments page of this report.

Second, a more broad group of specialists were consulted to help determine the priorities for research and action initiatives. This was to ensure that the resultant views expressed covered a broad range of interests relevant to Victoria. Again, these individuals and the organisations they represented are listed in the acknowledgment page and their input to the process was extremely useful and valuable.

International assistance was also sought with this review and priority setting to ensure that the outcome was broad and of maximum benefit. Dr. John Eberhard of the National Highway Traffic Safety Administration visited Australia and generously provided his expertise and knowledge on overseas developments and their relevance for Australia. The Federal Office of Road Safety also provided valuable assistance in this process.

### **1.4.3 Strategy Document**

All this information was finally brought together to highlight issues relevant to older drivers and identify and prioritise outstanding research and management issues that need to be addressed in the future. This document stops short of providing an outline program for addressing this issue as this is outside the scope of this report and the Centre (it is assumed that those responsible for initiating research and implementing countermeasures will take the recommendations from this report and build them into future programs as resources become available).

## 2.0 OLDER DRIVER CRASHES & POPULATION CHANGES

The older driver crash results reported in this Chapter were drawn mainly from Victorian statistics (Fildes, Corben, Kent, Oxley, Le and Ryan, 1994). However, many of these findings closely parallel those reported by Elliott, Elliott and Lysaght (1995) and hence appear to be quite representative of other Australian states as well.

### 2.1 OLDER DRIVER CRASHES

Older drivers are not a large road safety problem in Victoria in terms of the number of crashes; they constitute only 5.7% of all casualty crashes and around 8% of those involving serious injury (see Figure 2.1). By comparison, young drivers account for 34% of all casualty crashes and a similar percentage of the serious injury ones. However, there are relatively few older drivers on the road compared to their younger counterparts and they tend to travel shorter distances. Thus, the safety of older drivers becomes of more concern when these numbers are adjusted to take account of the distance travelled as shown in Figure 2.2 and 2.3. Here, their crash rates increase substantially, especially those involving a fatal outcome where they account for up to 25% of road trauma per km travelled.

In short, these findings show that while older road users have relatively few crashes, they are much more likely to be severely injured or killed given crash involvement.

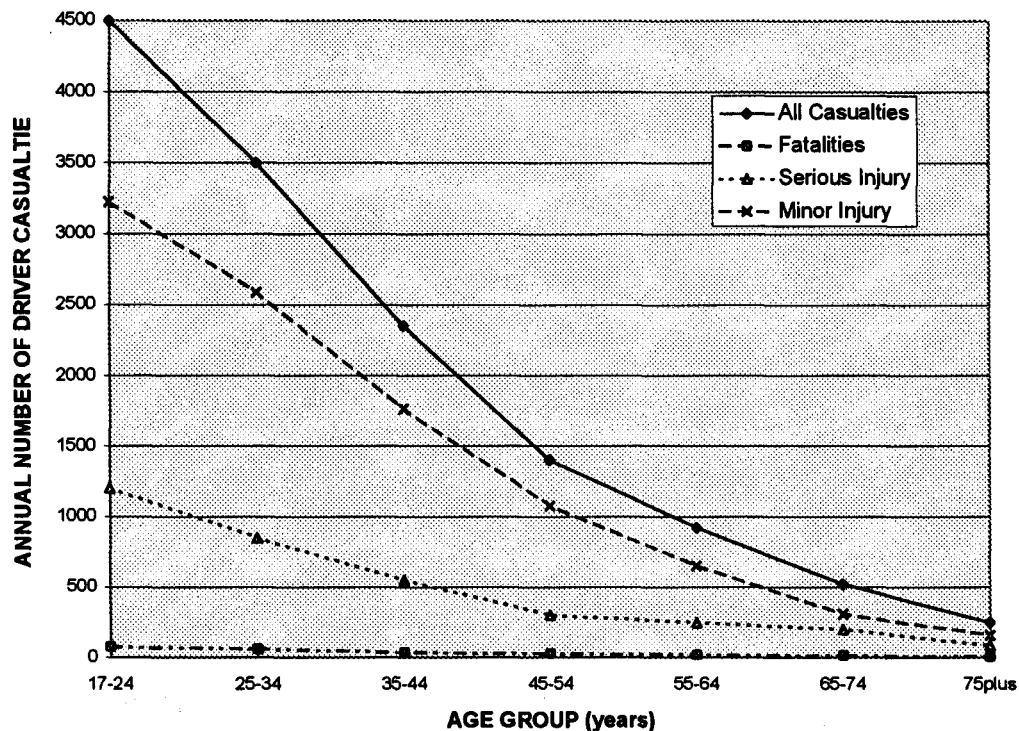


Figure 2.1 Average number of casualty crashes in Victoria, 1984-93 (from Fildes, Corben, Kent, Oxley, Le and Ryan, 1994)

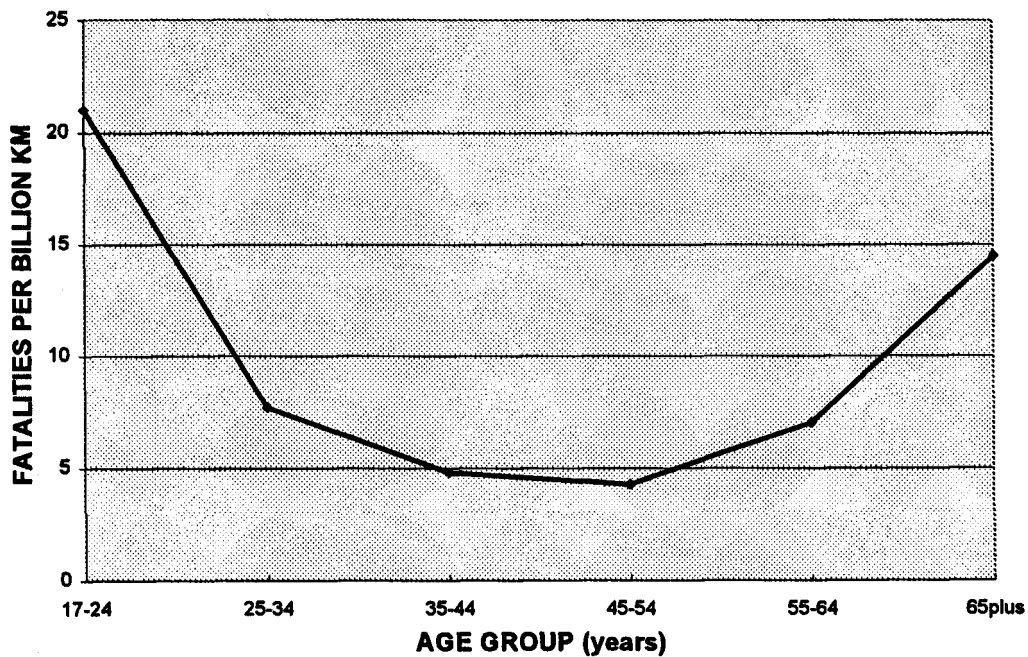


Figure 2.2 Annual driver fatality rate per distance travelled, Victoria, 1984-92 (from Fildes, Corben, Kent, Oxley, Le and Ryan, 1994)

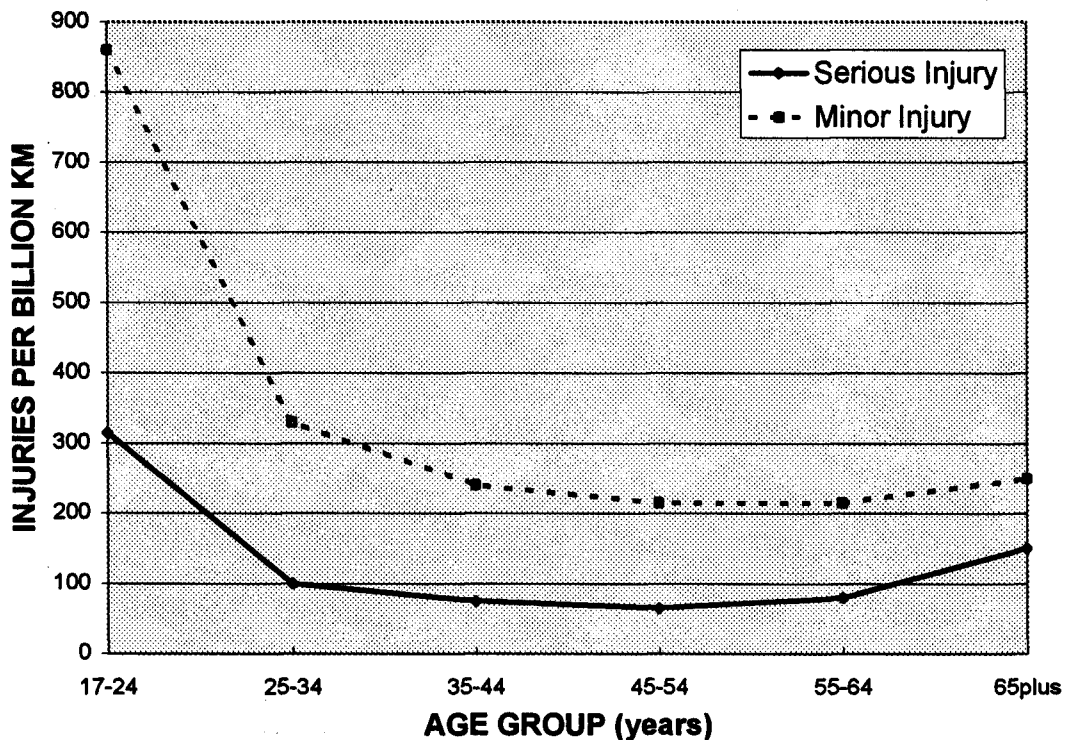


Figure 2.3 Annual driver injury rate per distance travelled, Victoria, 1984-92 (from Fildes, Corben, Kent, Oxley, Le and Ryan, 1994)

### 2.1.1 Crash Involvement

It is not possible to test whether older drivers have more crashes per kilometre travelled from Victorian data as uninjured reporting is not consistent. However, in New South Wales which has a tow-away entrance criterion, it is possible to compare crash involvement rates. It would be worthwhile undertaking an analysis in future using these data to test whether

older drivers are involved in more minor crashes per distance driven than their younger counterparts. (Eberhard, 1996, in fact, failed to show any substantive increase in crash involvement rate per distance travelled across all crash severities).

### **2.1.2 Types of Crashes**

The types of crashes that older drivers have are a little different to those of other drivers. They are more likely to crash during daylight hours and on dry roads than younger drivers, be well under the legal BAC limit, more likely to crash at an intersection, and be performing complex traffic manoeuvres at the time. They are also more likely to be injured from a rural crash, even though they are less likely to be involved in a crash outside urban areas. This is another indication of their susceptibility to injury as rural crashes tend to be more severe.

McKnight (1996) also examined older driver crashes and traffic violations in the USA using data obtained from the police and Department of Motor Transport. He noted that common behaviours associated with older driver crashes in the USA included running off the road, failing to stop or yield at intersections, rear end collisions, crashes during backing manoeuvres and turning across traffic.

### **2.1.3 Crash Causation**

The reports found in the literature on the cause of older driver crashes were ambiguous. Hakamies-Blomqvist (1996) argued that there are many reports in the literature that show that older drivers are more often the legally responsible party in a crash, although these are commonly based on proportional findings. Elliott et al (1995) also reported that older drivers in the national fatal file were more often judged to be responsible for the crash, presumably from either police or coronial findings. They noted odds of almost 6 to 1 that a driver aged 80 plus was judged responsible for that crash, compared to younger adults, and two and one-half times greater than the corresponding rate for teenage drivers.

There are, however, other reports in press that suggest that older drivers are no more responsible for their crashes than other age groups. Another more recent (unpublished) US study reported no difference in the "at-fault" status of older drivers in crashes causing serious injury. Moreover, the question of bias in many of these assessments needs to be taken into account. This is one area where further research is clearly required as it has direct implications for older driver management programs.

### **2.1.4 Cost of Older Driver Crashes**

The cost of older driver trauma in Victoria is estimated to be of the order of \$45 million annually (\$180 million for Australia). The cost of injury insurance for older people injured in a car crash in Victoria is roughly two-thirds that of younger casualties given the fact that many of these people do not work and cannot claim for loss of earnings and earning capacity.

They do, however, have higher claims for hospitalisation and rehabilitation as they do not recover as quickly or often as well as younger people.

## 2.2 THE AGEING POPULATION

Much of the need for further research and management effort in this area relates to predictions of the number of older road users over the next 30 to 40 years as the present population ages. There are a number of relevant aspects that need to be considered-

### 2.2.1 Population Changes

Most western societies predict substantial changes in the proportion of older persons in the population in the foreseeable future as the current population ages. The so-called "baby-boomer" or post-war generation is ageing and the current younger generation is proportionally less, thus the society is said to be "greying".

Predictions in Australia (Young, 1990) are for the proportion of older people to roughly double between 1990 and 2030 from 12% to around 25%, as shown in Figure 2.4. These figures are roughly equivalent to similar ones published for the USA (Stanfield 1996), Western Europe (Schlag et al, 1996; Michalik 1996; Blomqvist 1996) and Japan (Sea & Takamiya 1996).

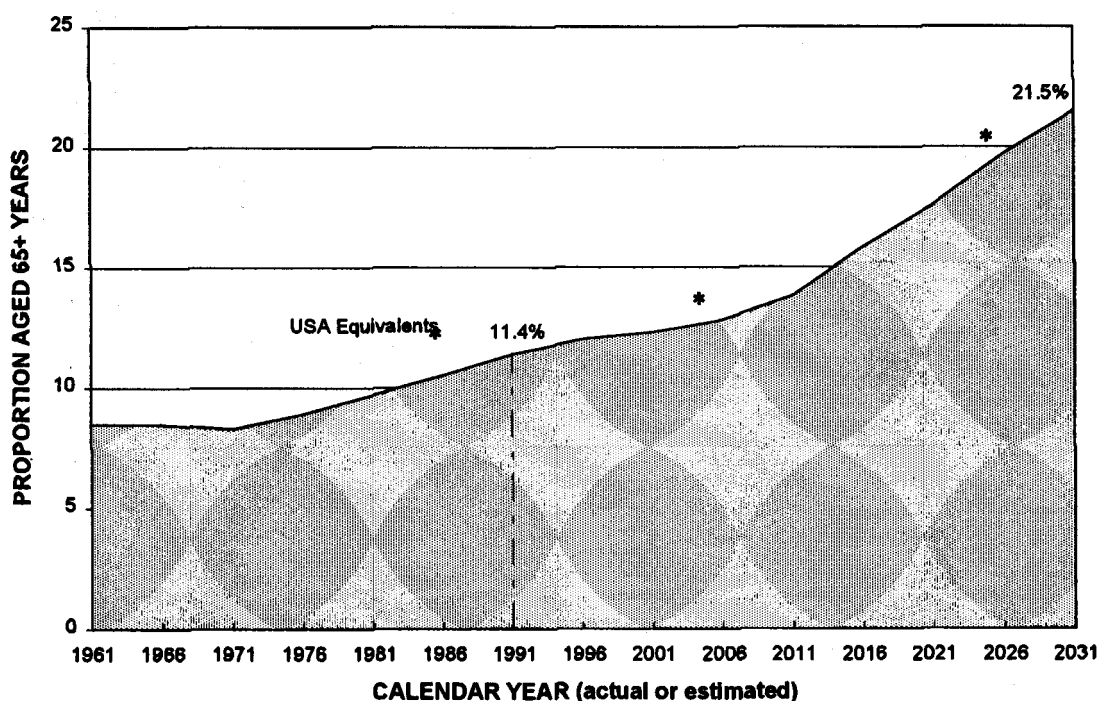


Figure 2.4 Proportion of Australian population aged 65 years or more (source; Young 1990)

### 2.2.2 Licensing & Mobility Changes

Not only is the proportion of older people in the population expected to increase but so, too, the number of licence holders. In the USA, for instance, Eberhard (1996) argued that the current 7% of males and 6.3% females over the age of 70 years who currently hold a drivers licence will expand to 13% and 18%, respectively by the year 2020, based on past and present licence rates in that country. A similar increase in the licensing rates between today's older drivers and those in the next generation is also apparent in Australia (VicRoads, 1996).

Moreover, tomorrow's older generation is much more mobile than the current generation as cars and travel have become more achievable and acceptable. Thus, as argued by Weinand (1996), *"the new elderly will strive more for mobility in their leisure time, especially auto-mobility, and the contentment and quality of life linked with it"*.

In short, not only will there be more older people over the next 30 or 40 years, they are likely to be more exposed than the current generation, both of which are likely to accentuate the older driver road safety problem in the years ahead.

### **2.3 RELEVANT MANAGEMENT & RESEARCH ISSUES**

A number of relevant management and research issues are still outstanding from examination of crashes involving older drivers.

- As the number of older drivers increases in the years ahead, there is a need to continue to monitor these crashes to ensure that adequate countermeasures are in place to reduce the frequency and severity of injuries to older road users.
- More details are required on whether older drivers cause more crashes than their younger counterparts and whether there are particular types of crashes of more prevalence (eg; rear-end, running red lights and pedestrian collisions). This is relevant for the development of future crash interventions for older drivers.
- Much of the exposure data on older drivers used in current analyses is old or incomplete. In particular, it is not known how many licence holders do not drive at all. There is clearly a need for more recent and comprehensive exposure data on older road users in Victoria.

### 3.0 OLDER DRIVER HEALTH ISSUES

A number of health issues of relevance for older drivers were highlighted in the literature and these are reviewed in this section. Many of these health issues apply equally to young and old drivers, although most are accentuated by the ageing process. Issues which are unclear and in need of further research are particularly of interest in this strategic review and are highlighted, including current developments overseas where known.

#### 3.1 DIMINISHING SKILLS THROUGH AGEING

The most pronounced effect of ageing for all people is the progressive loss of sensory, cognitive and motor skills with advancing years. Even healthy older adults suffer a degree of disability through the ageing process and most learn to adapt their behaviour accordingly. A comprehensive review of these losses was provided by Oxley et al (1995) and include:

- visual acuity
- contrast sensitivity
- visual field loss
- dark adaptation and glare recovery
- auditory capacity
- perceptual performance
- motion perception
- attention capacity;
- cognitive processing ability;
- decision time deterioration;
- loss of memory capacity;
- neuromuscular and strength loss;
- postural control and gait changes;
- reaction time.

Indeed, when considering the range of penalties of ageing, it seems remarkable that older people are still able to lead relatively normal lives. Of course, much of the deterioration occurs very gradually and individuals learn to overcome or adapt to these deficiencies extremely well. In addition, older people are able to adapt to these changes to some extent by diet and physical and mental exercise. Injuries tend to occur more frequently among those who are not aware of their reduced abilities or fail to modify their behaviour accordingly.

Of relevance to older drivers is how these diminished skills affect their driving abilities and here there is very little that seems to be widely accepted in the literature. -

##### 3.1.1 Visual Acuity

It is well known that the driving task relies predominantly on vision, yet age-related deteriorations or visual disease losses in static visual acuity do not correlate well with increases in crashes (Shinar & Schieber 1991). These authors point out that acuity under reduced illumination has not been studied well. Owens and Andre (1996) however, did show that older drivers showed significant losses in steering performance at mesopic or twilight luminance levels which younger drivers did not. Nevertheless, the correlations between static visual acuity and increased risk of crashing are weak at best (see Shinar 1977).

Dynamic visual acuity (the ability to resolve details in a moving target) seems to be a better predictor of crash risk in a number of studies (Burg 1964; 1967; 1968; Hills 1975;

Shinar 1977). Its deterioration appears to commence ahead of static visual acuity losses and seems to be more relevant to the driving task; much of the visual requirements in driving require assessments of rate of change information on the retina rather than the ability to discriminate fine differences in the fovea. Shinar and Schieber (1991) highlighted a number of directions for future research and development needs as shown in Table 3.1 below.

**Table 3.1 Directions for Future Research & Development (Shinar & Schieber, 1991)**

1. Improved understanding of the relationship between eye pathology and visual performance deficiencies.	5. Nighttime vision studies to determine what is acceptable eyes-off-the-road time and headlight design to reduce glare.
2. Improved visual performance through training and/or optical aides.	6. Highway design characteristics to improve night vision for older drivers.
3. The development of vision tests that are most relevant to driving performance.	7. Visual domains in which older drivers are aware or not of their deficiencies.
4. Studies to comprehensively assess the interaction between vision, age and driver safety comprising large scale correlational and smaller scale specific focus studies.	8. Measures of complex visual skills, especially the relationship between vision and cognition in ageing.

### 3.1.2 Age-Related Visual Disease

Klein (1991) also discussed the role of age-related eye diseases and driving among the elderly where he noted four ocular conditions were predominantly responsible for the decline in visual acuity and visual field loss, namely cataract, macular degeneration, glaucoma (open-angle) and diabetic retinopathy. He noted that there were few epidemiological studies available about the role of these conditions and driving performance and listed an additional four research needs in this area, namely:

- a better understanding of the relationship of specific functional abnormalities such as night vision, dynamic visual acuity, motion perception, disability glare and contrast sensitivity with driving performance;
- examining the incidence and progression of the onset of these specific functional abnormalities in ageing;
- understanding the effects of treatment of these conditions on visual function tests; and
- describe potentially preventable risk factors for these conditions.

### 3.1.3 Useful Field of View

One of the more promising measures of visual function performance which has been related to crash risk is the Useful Field of View (UFOV) test described by Ball and Owsley (1991).

This test involves assessment on three tasks of varying degree of complexity from a simple vehicle identification task to a choice selection involving visual clutter task. The authors argued that UFOV is a multiple level visual/cognitive information processing measure

which correlated well with crashes at intersections. They also found no relationship between UFOV and good or poor eye health.

Of some interest was the fact that the Mattis Organic Mental Status Syndrome Examination test MOMSSE which assesses mental status also correlated well with intersection crashes, although with a slightly higher tendency to miss someone with the characteristic in question (lower sensitivity) or to falsely predict someone who does not (lower specificity) than the UFOV test. However, very little attention has been paid to this measure subsequently. In addition, two other studies have not been able to replicate these findings (Brown, Greany, Mitchell & Lee, 1993; Hennesey 1996).

The UFOV test is presently very expensive to purchase and to this author's knowledge, has not been thoroughly tested in a licence administrative environment to date. Indeed, Ball and Owsley (1991) argued that it is not a simple quick measure to administer and requires a trained health care professional to administer it. Thus, while it may be a useful research tool and a possible early screening test for high-risk elderly drivers, it is unlikely ever to be used as a licence screening test by motor vehicle departments. Further research is warranted to refine and determine its usefulness in predicting older drivers who are at high risk (it is expected that much of this work will be done by Ball and Owsley and is worth monitoring).

#### **3.1.4 Cognitive Processing**

Cognitive processing abilities are known to change during the ageing process. Kosnick et al (1990) suggested that cognitive factors contribute to a larger proportion of crashes for the elderly than pure sensory or perceptual factors. Indeed, many of the factors behind crashes to these people highlighted in the previous section (eg; an over-involvement of older drivers in crashes at unsignalised intersections) could be attributed to some degree to reduced cognitive abilities and capacities.

Stutts, Stewart and Martell (1996) examined the relationship between five relatively brief tests of cognitive function with driver crash involvement, namely the Trail Making Test version A and B, the Short Blessed Test, a modified AARP "reaction time" test and a timed traffic signal test (the form of each of these tests is not described well in this paper and further details have been sought). They found that poor performance on all five tests correlated to some degree with an increased risk of crashing. However, the best estimate of prior crash involvement included a combination of the Trail Making B test along with driving frequency, annual miles driven and age, although the authors were quick to point out this model did not capture a large proportion of the variance associated with this model.

### **3.2 DISABLING HEALTH CONDITIONS**

The general health of the older driver is often considered to be a predictor of crash risk. In another review of the medical literature, Marottoli (1996) listed a range of medical factors that he argued had the potential to be risk factors for older drivers. However, he was only able to claim reasonably definitive evidence for dementia and possibly diabetes. He noted that while dementia seemed to be associated with an increased likelihood of crashing, the full extent of this was unclear and required further research. The most comprehensive excellent review of impairing medical conditions found so far was that undertaken by Janke (1994) who sought to examine the role of dementia, cardio- and cerebrovascular

conditions, ocular system disorders, pulmonary disease, diabetics and arthritis upon driving competency of older persons. These are discussed separately below.

### 3.2.1 Dementia

The evidence for dementia as a risk factor in driving seems quite overwhelming from the range of studies that Janke (1994) and Marottoli (1996) reviewed. While dementia can take as many as 60 different forms, the most prevalent is Alzheimer's disease (estimated prevalence rates of 12% to 15% for those aged 65 years or older and as high as 48% for those over 85 years, cited in Janke, 1994). Dementia is also likely to be associated with other disabling conditions, the so-called "comorbidity problem".

Three stages of Alzheimer's disease (AD) degeneration were identified by Cummings and Benson (1983) ranging from mild to severe dementia. According to Janke (1994), Messinger described the relationship between the ability to drive and the onset of AD. During Stage 1 (*mild dementia*), driving is apparently done on the basis of automatic over-learned functions with diminished ability to respond to novel stimuli. In Stage 2 (*moderate dementia*), there is an inability to drive competently with the person suffering general disorientation and little insights into the presence of impairment. By Stage 3 (*severe dementia*), the person is typically vegetative and the question of driving does not arise.

In his review of dementia publications, Marottoli (1996) was particularly interested in issues of cessation, crashes and performance. While the range of effects was large, he argued that most studies did show some increased risk of a crash and/or decrements in performance for demented patients over matched controls. Moreover, while some had stopped driving, a number continued to drive in spite of their conditions and recent crash records. Performance differences were also noted for dementia patients in a study by Odenheimer (cited by Janke, 1994) where the major factors associated with a performance decrement seemed to be declines in attention and visuospatial skills.

The presence of dementia and the need to cease driving is, however, not clear. O'Neill et al (1991) reported that of 48 patients with mild or moderate dementia, 22% continued to drive where average condition duration was 4.5 years. No crash statistics were provided unfortunately because of the low numbers involved. Of those with mild or moderate dementia, roughly half were still judged competent to drive by their caregivers. O'Neill et al concluded that while these assessments may not have been accurate, it is not certain that early stage dementia is necessarily associated with diminished driving ability. Clearly, these people and their "care-givers" are not always able to judge when driving should cease.

Other studies have also reported similar rates of demented drivers continuing to drive. However, Waller and others (1993), found no relationship between dementia and increased crash risk, although Janke (1994) suggested this may have been the result of differences in exposure between demented and control cases. As noted earlier, Marottoli (1996) argued that research was required in this area to highlight the relationship between risk and the magnitude, severity and degree of impairment of dementia, involving better cohort, case-control and pooled data studies to provide necessary thresholds.

From a management viewpoint, the State of California Department of Motor Vehicles have already published Guidelines for Evaluating Drivers with Dementia. They maintain that only drivers with Stage 1 dementia should be considered still able to drive and only then if they submit to a re-examination and pass it. It is not clear, though what re-examination is

involved or how objective the process is. It is also understood that the province of British Columbia in Canada is about to introduce dementia criterion (Mini-Mental State Examination score of 24 or below, Folstein, Folstein & McHugh, 1975) for licence cessation by demented drivers (Dobbs, 1996a). Janke has subsequently argued that this is likely to catch some dangerous drivers but will probably let many others pass through the screen as the MMSE is not very sensitive. To score 24 or below means that the driver concerned has to be substantially impaired or poorly educated (MMSE scores are a function of educational level) which might introduce bias unless the poorly educated are also less competent in every day activities, for which there is some evidence.

***Parkinson's Disease.*** Parkinson's disease involves both motor and mental degeneration and dementia is associated in a proportion of cases. Janke (1994) reported that while the studies she examined could not be considered definitive accounts of the relationship between Parkinson's disease and crash risk, the evidence was "highly suggestive". Like other forms of dementia, however, what level of Parkinson's disease at which a driver becomes unacceptably dangerous is not clear from these studies.

Other conditions which affect cognitive (as well as sensory and motor) functions include the consequences of cerebrovascular accident (stroke) and the more severe head injuries.

### **3.2.2 Cardiovascular Conditions**

At first sight, it would seem that drivers suffering some forms of cardiovascular conditions would hardly be fit enough to drive, yet the evidence is not conclusive. A number of cardiovascular conditions have been proposed as risk factors for driving such as Angina, cardiac failure, arrhythmia, hypertension and arteriosclerosis. While some studies have reported increases in the number of crashes for patients suffering some of these factors (eg; hypertension and arteriosclerosis), others have shown the opposite.

Waller and Naughton (1983) found that drivers with ischaemic heart disease (defined by hospital admission) had no higher crash rate than controls matched for age, sex and place of residence. Waller (1987) subsequently argued that cardiac patients tend to change their lifestyle dramatically after diagnosis and in fact tend to drive much less and at less stressful times. Hence, differences in driving exposure may well compound crash statistics here.

Janke (1994) in a 1978 study concluded that the majority of cardiovascular patients do not pose an increased hazard to society through their driving because of reduced exposure to accident risk, and this still seems relevant today. The advice that doctors should be giving cardiac patients, though, is clearly to avoid driving wherever possible. For a newly diagnosed cardiac condition such as arrhythmia, it may be wise to suggest a temporary cessation period as proposed by Larsen et al (1994) until assessment is complete or the condition is modified by surgery or medication. The medical profession is well placed to provide this advice to their clients although there may still be a need for more definitive guidelines for medical practitioners, based on well controlled scientific research findings (Austroads are currently working on developing "*Fitness To Drive*" guidelines which should be available soon).

A number of cardiac conditions are modifiable or controllable by surgery (ischaemic heart disease and valvular disease), prostheses (pacemakers for some arrhythmias) or medication (hypertension or other arrhythmias) and correspondingly cease to be major risk factors.

***Death At The Wheel.*** Alarm is sometimes expressed when a crash occurs and the driver is found to have died from "natural causes", nearly always heart disease. In a well controlled but now old study, such incidents were found in 7% of driver fatalities in Brisbane (Tonge, O'Reilly, Davison, Johnston & Wilkey, 1977). According to these authors, "*in many cases, the driver had warning of impending collapse and either slowed or was able to stop the vehicle. In none of these crashes did any person other than the driver sustain injury*".

In general, any condition in which the risk of sudden incapacity (as opposed to those with persistent symptoms or disabilities) that cannot be ascertained by a suitable test is of some concern. There seems to have been few, if any studies which have attempted to estimate acceptable levels of risk and the matter is handled on the basis of consensus of expert opinion, expressed as quasi-standards such as guidelines to medical practitioners.

***Chronic Pulmonary Disease.*** While healthy older drivers do not necessarily suffer respiratory problems, some studies have reported Chronic Obstructive Pulmonary Disease (COPD) or Chronic Obstructive Airway Disease (COAD) to be quite common among older people. The primary aetiological factor for this condition is smoking which was arguably more prevalent among this generation. In severe cases of COPD or COAD, the person complains of chronic weakness or tiredness, invariably suffers persistent bronchitis and coughing and can experience diminishing judgement skills and concentration through lack of oxygen in the blood. Janke (1994), however, could only find one or two studies that attempted to address the effects of COPD and driving. These studies did not assess the performance or safety consequences directly but offered expert opinions about the ability of these people to drive. Clearly, more definitive evidence is required here before these opinions could be taken as clear evidence for intervention.

Sleep apnoea is another pulmonary condition likely to have adverse consequences for drivers. Those suffering sleep apnoea are likely to have small "cat-naps" while driving and thus face the possibility of inattention at critical stages of the driving tasks. While Marottoli (1996) included sleep apnoea as a potentially critical medical factor for older drivers, he did not present any data confirming its role as a risk factor for crashes. This is not to say that it does not pose a crash risk, rather there is a lack of evidence available at this time of the prevalence and relationship between sleep apnoea and safety.

### **3.2.3 Cerebrovascular Conditions**

These conditions typically include Cerebrovascular Accidents (CVAs or strokes) and Transient Ischaemic Attacks (TIAs or mini-strokes). In studies reviewed by Janke (1994), it was claimed that CVAs can be a major source of neurological disfunctioning among white Caucasians, often leading to some permanent cognitive or physical disability. Janke reviewed an impressive number of studies of the effects of CVAs and TIAs on driving ability but which failed to provide any real direction for addressing this problem.

The studies generally showed that CVA victims perform less ably than equivalent non brain-damaged people. While higher order perception and cognitive processing abilities typically used in strategic planning and tactics seemed to be particularly affected, so too did lower order operational skills such as tracking, handling, reaction time, co-ordination, traffic judgements, and so on. Not surprisingly, the degree of disruption was dependent on the type and extent of neurological deficit and age, and while re-training was possible in a number of cases, the long-term crash involvement consequences were not adequately assessed in most of the studies reported.

Janke (1994) also reviewed a number of studies that attempted to develop or evaluate tests to screen those who are likely to be most at risk after a CVA or TIA. Several of these studies reported that conventional neuro-psychological or perceptual tests generally did not validate well with the skills and abilities normally required for safe driving. While specific batteries of psychometric and simulator tests such as those proposed in the "*Cybernetic Model of Driving*" by Galski, Bruno and Ehle (cited Janke, 1994) seemed to perform better in discriminating poor driving performers on the road, it too, does not appear to have been validated against subsequent crash history or traffic violations. Off-road driving courses for CVA victims have also not been shown to be good predictors of on-road performance.

One is left not really knowing what to do about drivers of any age who suffer cerebrovascular conditions and this is clearly one area where more research is urgently required. Janke noted that in the United Kingdom, all persons who suffer a CVA or a TIA automatically have their driving licences suspended for 3 months and have to prove their fitness to drive again after that time. While this would seem to have some merit in the face of the performance decrements associated with these disorders, no clear test seems to be available at this time for making this judgement.

### **3.2.4 Diabetes**

Diabetes is claimed to affect between 3% and 6% of the population and seemingly more so for older people. For practical purposes, diabetes can be classified as either insulin-dependent which can usually be corrected simply through insulin ingestion, or non-insulin-dependent, normally treated through diet, exercise, or diet plus a drug. Acute effects of diabetes can lead to reductions in attention, cognition, vision and consciousness while chronic or long-term diabetes can lead to permanent vision, sensation and vasculature changes.

Hypoglycaemic attacks (insulin reactions) are virtually confined to the first class. They can vary from minor symptoms such as sweating, tremulousness, tingling around the mouth, all of which are not infrequent, to more severe reactions. Typically, these can often include impaired perceptive and motor skills, abnormal behaviour, and impaired consciousness. It is usual for motor vehicle authorities to have rules regarding drivers who are diabetics.

Marottoli (1996) reviewed a number of studies which examined the relationship between diabetes and driving performance and safety. From these studies, he concluded that hypoglycaemia (reduced blood sugar levels) seemed to be associated with reduced cognitive and sensory skills and driving performance and may not be recognised as a risk factor by the driver when it occurs. From crash data, he claimed there seemed to be a slight increase in risk of serious crashes for hypoglycaemic drivers but of questionable risk for all crashes. Janke (1994) also reviewed much of the recent evidence of diabetes and safety and claimed that the crash results were quite mixed, probably due to confounding factors. She agreed with an earlier study by Waller (1973) which concluded that the major factor in the safety of diabetic (older) drivers may be hypoglycaemia or their reaction to insulin.

One particular study cited by Janke (1994) was that of Ward and Stewart in the New Zealand Medical Journal who apparently reported that forty percent of insulin-dependent diabetic patients had experienced hypoglycaemic attacks while driving and that 13% of these attributed a traffic accident to bouts of hypoglycaemia. While she cautions about overreacting to this finding given the minority of drivers (including the elderly) who suffer this condition, nevertheless, this is an important finding for the safety management of these patients.

De Klerk and Armstrong (1983) found that diabetics in general have no increased crash risk, though there was a slight increased rate for young male diabetics. The driving exposure concerned was almost entirely private motoring, and the diabetic group was biased to more severe diabetics. The relevance of diabetics to older drivers seems to lie mainly in its propensity to cause complications such as diminished vision. This is properly dealt with as a persistent impairment, as noted above.

### **3.2.5 Arthritis**

Arthritis is a common condition among older people, estimated to affect more than 50% of those over 65 years and severely in 12%. Severe forms of arthritis include osteoarthritis (OA) and rheumatoid arthritis (RA) and commonly cause daily pain, reductions in mobility and range of movements, strength, ability to care properly for themselves and do household activities and reduced physical endurance. Those with arthritis are also more likely to have other disabilities than those without.

Janke (1994) reported studies demonstrating that older drivers with arthritis often experience decreased head and neck movements which can impede their ability to scan properly while driving. Impediments in their hip and leg joints can unduly affect pedal movements while the lack of grip strength can make steering and control movements very difficult. However, from a report cited by Roberts and Roberts, she noted that choosing particular car options such as large opening doors, power steering, automatic transmission and large mirrors can often offset some of the problems associated with arthritis. Lings (1992) tested locomotor disorder caused by neurological conditions in a mock car where, in general, arthritis subjects coped far worse than normals and the results could not be predicted from clinical tests.

Neither Janke nor Marottoli, however, reported any study which attempted to establish crash risk for arthritic drivers. Presumably, these would have suffered from a number of compounding influences, although given its prevalence rates, it should be possible to control for many of these and still have sufficient numbers for crash comparison. Janke noted that some studies had shown that movement in some joints could be improved to some degree by intensive exercise training for arthritic drivers but this did not always relate to improved on-road driving performance. Given the high prevalence rate of arthritis and the possible safety consequences, this would seem to be an area where further research and intervention effort might be warranted in the interests of improving older driver safety.

### **3.2.6 Medication**

A number of prescription medications have the potential to adversely affect driving skills and messages to this effect are required to be printed on the labels and packages containing these drugs. Indeed, in some European countries, the labelling requirements of prescription medication seems to be more stringent than that currently in Australia and these efforts are to be applauded and encouraged.

Medication is a difficult area to deal with in older people as many of them require continuing medication (including polypharmacy) for their health and quality of life needs. It seems more pertinent, therefore, to focus on the disabling health condition rather than the medication in deciding who should or should not drive. However, this disregards the severe effects that drugs such as narcotics, hypnotics (including barbiturates), anxiolytics, antihistamines, relaxants, and others which may be taken for a number of reasons and fall outside detection through focus on their underlying state.

Janke (1994) points out that many of the studies that have attempted to correlate medication with increased crash risk are flawed in one way or another. Studies which have detected the presence of medications, stimulants and illegal drugs in fatally injured drivers of crashed vehicles are often interpreted as showing that the drug detected played a causative role in the accident. The frequency with which the same drugs are present in the corresponding driving population are not usually reported. This is one area where research is clearly warranted before intervention programs are developed to counter these effects.

### **3.2.7 Other Health Issues**

A number of other health conditions have been raised as possible risk factors for older drivers, namely psychiatric and psychological disorders, cancer and liver disorders.

Incontinence, also a common condition among older females and males, has been suggested to put the older driver at risk of collision. The evidence for these conditions affecting the safety of older drivers and their passengers, however, is scant and further research is necessary to establish the need for intervention programs addressing them. This is not to say, however, that in cases where a medical practitioner feels that an individual is especially at risk that the patient and their family should not be cautioned against that person driving and, where warranted, notifying the licensing authority accordingly.

## **3.3 HEALTH MANAGEMENT & RESEARCH ISSUES**

This review did not attempt to conduct an exhaustive literature review of the effects of older people's health issues on driving performance. Indeed, there were several excellent key reviews undertaken in this area recently which did review the available scientific evidence adequately from which general conclusions could be drawn about the state of knowledge and areas where further research and/or management initiatives are required. A summary of the key findings from these reports is provided below.

### **3.3.1 Health Conditions Potentially Important**

From the literature reviewed in this section, a number of health and ageing conditions seem to have the potential to influence the safety of older drivers. For vision, these include the ageing effects of poor dynamic acuity and field of view and the underlying eye disease conditions of cataract, glaucoma, macular degeneration and diabetic retinopathy. However, there were a number of research needs identified in the vision and visual disease area to provide guidance for understanding, prioritising and screening older people's vision to improve road safety.

Cognitive processing seemed to be one area where severe functional deficits seemed to be related to poor driving performance and crashes, although further research is warranted to understand this further as well as what constitutes acceptable and unacceptable levels. Other health conditions of potential interest for older driver's safety include dementia, diabetes, non-stable cardiovascular conditions, strokes and Transient Ischaemic Attacks. Severe arthritis, too, would seem to be incompatible with safe driving. However, further research to highlight the relationship between risk and the magnitude, severity and impairment thresholds is still required. Also, the degree to which drivers with these conditions are aware of their effects and compensate for their disabilities would be worth investigating further before committing to expensive screening and intervention programs.

### **3.3.2 Health Conditions Requiring Further Substantiation**

A number of other health or medical conditions were raised as potentially unsafe for older drivers including cognitive degeneration (apart from dementia), a number of relatively common yet stable cardiovascular conditions, chronic pulmonary disease, sleep apnoea, and other forms of diabetes and some forms of arthritis. However, the evidence of their road safety risks was either not conclusive or not available and requires further substantiation.

### **3.3.3 Potentially Relevant Tests**

Screening tests for these conditions or disorders is an important topic both for research and possible intervention management. Several tests were alluded to in the review of potential use in identifying those at risk. While some of the standard tests for dementia might well suffice for widespread use, a number of others are either still experimental or too intensive or time consuming for widespread screening purposes. Further research is warranted and in some cases currently underway to substantiate or develop them further and more is said of this in a later section of this document.

### **3.3.4 Relevant Management Issues**

The prioritising and management of older drivers with undesirable health and medical conditions is a sensitive issue requiring considerable specialist knowledge and input. It would seem inconceivable for this to be done outside the current medical fraternity and seems to suggest the need for medical practitioners to play a primary role in the identification of people at risk and notification of these people to the relevant licensing authorities. Indeed, this is a mandatory requirement on medical practitioners in a number of countries already, although the degree to which it is adhered to is not well documented.

The development of a scale of health impairment, similar to the Abbreviated Injury Scale used for classifying injury severity, is currently being undertaken by the Association for the Advancement of Automotive Medicine in Illinois, USA for the Federal Highways Traffic Safety Administration. It would be prudent to monitor developments in this area as a guide for planning future road safety initiatives involving the health of older drivers.

Some medication and combinations also seemed to be associated with an increase risk of crashing, although it is not clear whether it is the medication or the underlying disorder. It is extremely difficult to know what to do with this risk factor, however, as older people rely on their medication for maintaining their overall health. Clearly, adequate labelling of medications known to cause drowsiness which is potentially harmful when driving is important and the evidence suggested that may not be optimal at this stage for those with poor vision.

### **3.3.5 Concluding Comment**

It is important to reiterate that just because an older person has a particular health or medical condition, it is not justification for preventing them from driving without sound evidence to support the likely road safety consequences. Current thinking overseas is that even if an individual has a well proven pre-existing medical or health condition, this should only be used for identification of those likely to be at risk and not as an instrument for licence cancellation. While confronting an individual with the facts about their condition might well lead to a voluntary cessation of driving, those not convinced need to have the option of a driving test available. More will be said of this later on in the review.

It should also be noted that while older people generally tend to have more health and medical problems, nevertheless, many of the disabilities reviewed here equally affect younger adults as well. Thus, one might ask if it is more appropriate to consider health and medical problems as an issue independent of ageing.

## **4.0 RE-LICENSING REQUIREMENTS FOR OLDER DRIVERS**

One issue that has created much concern and discussion world-wide is the requirement for older drivers to demonstrate periodically their ability to drive. The proponents for regular retesting of older drivers argue that it is unwise for people in their "twilight" years to be issued a licence to drive without demonstrating that they are fit and capable of driving without risk to other motorists. Those against advance reasons against re-licence tests, based on cost-effectiveness, equity issues, the inability of licence tests to discriminate those at risk, and so on. This section addresses many of the issues associated with re-licensing of older drivers, highlighting areas where further knowledge or intervention emphasis is required. A number of pilot programs are currently underway internationally and these are described also.

### **4.1 AUSTRALIAN STATE REQUIREMENTS**

The licensing of drivers is a state requirement in Australia. Table 4.1 was derived from information in the Federal Office of Road Safety's 1993 edition of "Driving Licensing Practices in Australia", updated with recent information obtained from each licensing jurisdiction. There are clearly different licensing requirements across the states and territories where NSW, Tasmania and the ACT have the more stringent requirements for older drivers than Victoria and the Northern Territories which have none. Interestingly, Queensland and South Australia have recently relaxed their requirements in response to concerns about the restrictive and inflexible nature of their previous policies towards older drivers.

#### **4.1.1 Proposed Changes**

A workshop was held recently at the 1996 National Road Safety and Enforcement Conference where representatives from each state traffic authority outlined current initiatives to older driver licensing and any changes planned for the immediate future. Apart from recent changes in Queensland and South Australia, no other state seemed to be considering changes in licence requirements. The StaySafe Committee in New South Wales are conducting an inquiry into driver licensing which, however, could lead to recommendations for change. There was considerable interest in the possibility and need for change. It is well recognised that driver licensing for older people is a topical issue at the moment and a few of the states and territories seem to be interested in examining current policies. There may be a case for national co-ordination of effort in this area in future. There has not been any recent scientific evaluation of crash differences and/or other road safety benefits for older drivers in the various states, given the differences that exist in requirements. Such an evaluation would be extremely worthwhile in the light of these differences and the large costs associated with maintaining these re-licensing programs. It might also be advisable to include New Zealand in any planned evaluation study, given their similar road network and driving culture, as it is understood that the NZ authorities are also interested in the need for older driver safety initiatives.

**Table 4.1 Driver Licensing Practices in Australia (1997)**

State or Territory	Age requirement for re-licence	Road test	Medical report	Vision test
Victoria	none	when reported	when reported	when reported
NSW	70 for road trains; 80 for cars & m/c	annually	annually	annually
South Australia	70 years	none for cars but required for truck and m/c licence	annually	annually
Queensland	75 years	none, other than when recommended by medical report	every 5 years	every 5 years
Western Australia	75 years	none, except when doubts raised by medical report or convictions	75,78,80 onwards annually	75, 78, 80 onwards annually
Tasmania	75 years	required annually from 85 onwards	annually	annually
NT	None	when reported	when reported	when reported
ACT	75 years	no	annually	annually

*NB: Details based on information provided by FORS (1993) and more recent correspondence with each driver licensing jurisdiction by VicRoads.*

#### 4.2 THE CURRENT VICTORIAN POSITION

The need for instituting re-licence requirements for older people was examined in Victoria during the mid-eighties when a report was undertaken by the then Road Traffic Authority of Victoria (now VicRoads) to examine the issues and, in particular, the costs and benefits of mandating re-test requirements for older drivers (Torpey 1986). This study concluded that the substantial costs associated with a re-testing program was unlikely to be offset by the benefits likely to accrue in terms of crash reduction. Hence, as Victorian fatality crash rate for older drivers at that time was as good, if not better, than other states, the current policy of no requirements for them was appropriate.

This is not to say that licensing for older drivers in Victoria is ignored as there has always been scope for reviewing licensing for any individual driver on a case by case basis. Under current policy, fitness to drive is usually assessed when concern for a particular individual's safety is raised with the licensing authority. This can be initiated by the individual's doctor or medical specialist, the police, the family or friends, of the person, or occasionally other care-givers. The individual is required to attend the agency (often with a family member) to discuss their driving and may be required to submit to a written or driving test. In many cases, the individual can be persuaded to surrender their licence voluntarily after these discussions, but it is possible to cancel the licence when this becomes necessary. To date, approximately 6000 cases are reviewed yearly using this process in Victoria.

A review committee was formed in the early nineties to examine the need for special licensing requirements for disabled drivers, including the aged. They concluded that re-licence testing for all older drivers was unlikely to discriminate good from poor drivers,

given the current tests available and that the current policy of addressing licensing on an individual case-by-case basis was still appropriate. Greater involvement by the medical profession in helping determine those likely to be medically unfit to drive was recommended but no formal requirement has been legislated, preferring this to be a voluntary initiative. A national review is underway by Austroads to update current medical fitness guidelines which should be available soon.

### **4.3 RE-LICENSING REQUIREMENTS OVERSEAS**

This review benefited from discussions with appropriate agencies in England, Germany and the USA. Of special interest was the single current concern in each of these countries for improvements in older driver safety as well as the recognition of the difficulty and complexity of the problem. Licensing requirements and future plans in these countries are outlined below.

#### **4.3.1 England**

It is understood that current licensing requirements in the UK call for a licence to be valid until age 70 after which renewal is required at intervals of not more than 3 years. Licence renewal is judged on the individual's medical condition only requiring the applicant to make a statutory declaration of his or her fitness to drive. No driving test is required of the applicant and presumably there are avenues available for caregivers to approach the licensing authority in cases where they feel the particular person is at risk.

In 1988, the Automobile Association (AA Foundation) surveyed a sample around 1000 older drivers (55 years or more) on a range of issues of relevance to them. In general, most of the respondents felt that the "After 70" licensing procedure was acceptable and adequate. Views on alternative procedures were also explored where there was clear rejection of any proposal involving broader medical screening, police intervention, the inclusion of a road test requirement, or any system involving financial penalty through insurance. Subsequently, the AA Foundation has maintained that the current system is satisfactory, although it hinted that development of a voluntary procedure for licence withdrawal, supported by advice and guidance (particularly from doctors) would not attract strong resistance.

#### **4.3.2 Germany**

Germany has a "*driving licence for life*" policy where, after attainment, there is no formal requirement for re-licensing again. Licences do not need to be renewed periodically and it is possible for a person to go through his or her entire driving life with the original licence. The only time that authorities carry out any form of licence assessment is after multiple violations or on community referral (family, medical profession, social system, etc.). Members of the medical profession are duty bound to alert the driver when they feel he or she is not able to drive safely because of any transient or permanent disorder and to inform the authority. However, it is unclear how often this occurs in reality. Legally, the GP is expected to advise the patient not to drive and to record this on their medical record. After that, though, they are free of legal obligation"

Current thinking in Germany seems to be that older drivers are not a problem in terms of the number of crashes they are involved in and that, for the most part, they tend to adopt safe driving strategies (that is, they drive off-peak, keep away from busy highways, only drive in good weather and light conditions, etc.). The German automobile association

ADAC argued that older driver countermeasures need to emphasise safe driving practices, rather than restrictions. They claim that older people need to eliminate risky manoeuvres, increase headway, reduce travel speed, and install special assistance devices in their cars such as power steering and ABS brakes to help with their driving. While this seems to be sensible advice to give to older drivers, it has not been formally demonstrated in Germany as an effective road safety initiative.

### **4.3.3 European Licence**

With the advent of the European Community, there is a current objective to develop a European Licence for all European citizens. It is understood that the European Road Safety Federation are close to completing a report on the European Licence including older driver requirements. Advice gained from recent discussions seems to suggest that the European proposal will include a 10-year licence for all ages but with a medical questionnaire after 70 years. There are a number of obstacles still to be overcome before a European Licence can be implemented, including standardised licence classifications, harmonised tests, and consistent road laws, signs, road markings and speed limits. Nevertheless, there is a strong sense of a common community in Europe and an expectation that a European Licence will become a reality in the not-too-distant future. The requirements for older drivers in this European licence are unclear at this time.

### **4.3.4 North America**

As in Australia, licensing is a state requirement in the USA and similarly, there are considerable differences in requirement across the various states (Janke 1994). The National Road Safety Authority (NHTSA) plays an advisory role in providing recommended procedures and materials for the states and in 1993 published a Traffic Safety Plan for Older Persons (NHTSA, 1993) listing areas of problem identification, program development and program evaluation where resources had or would be allocated. More recently, they commissioned a study to develop a model driver screening and evaluation project (see below) which is of relevance to current deliberations in Victoria. In addition, there have been one or two other calls for innovative approaches to licensing.

## **4.4 NEW LICENSING PROPOSALS**

A number of new or current models of re-licensing for older drivers have been proposed in the USA which are reviewed below.

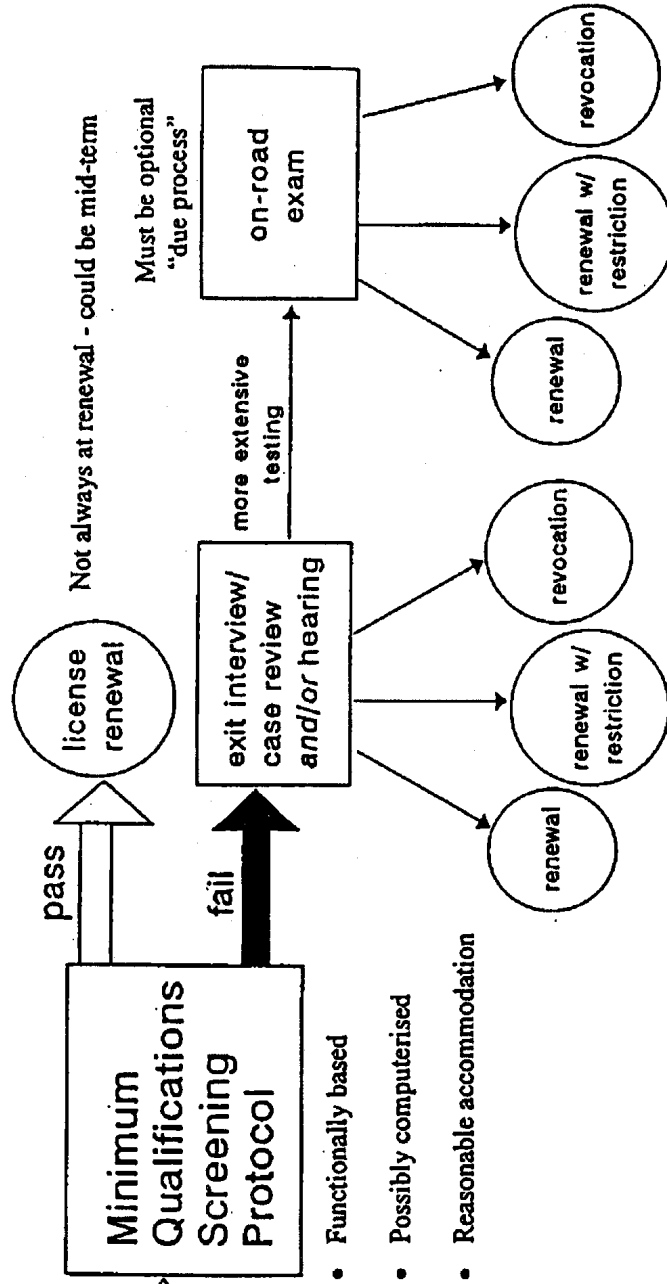
### **4.4.1 The Model Driver Screening & Evaluation Project**

To date, there has not been any final recommendation by NHTSA for a co-ordinated licensing procedure as they are currently involved in a comprehensive program of research. A Model Driver Screening and Evaluation Project commenced towards the end of 1996 by Loren Staplin and associates of the Scientex Corporation aimed at developing an agreed workable licensing assessment procedure. Figure 4.1 shows diagrammatically an early draft proposal of this procedure.

IDENTIFICATION OF TESTING CANDIDATES: SELECTION FROM APPLICANT POOL

- ? age-based selection
- family referral
- police referral
- physician referral
- DMV referral via "diagnostic application form," and/or based on driving record

TESTING OUTCOMES AND LICENSING ACTIONS



The focus of the system is on those with a functional deficit, rather than poor crash performers

Figure 4.1 Administration of the Model Assessment Procedure

It should be stressed that the model licensing procedure is currently in development and hence may change substantially before it is introduced. Nevertheless, it is worth reviewing as it stands as it reflects current thinking in the USA towards a suitable re-licensing procedure for older drivers. The proposed procedure does include the option of mandatory licence testing for all older drivers but preference at this stage is to adopting a community referral mechanism for those seemingly at risk. Current thinking is that mandatory screening based on some chronological threshold is not only discriminatory but also not justified nor cost-effective, and is unacceptable to the majority of the population. The proposed procedure has *four* phases, comprising identification, screening, review and then more extensive testing. Each of these is described in more detail below.

1. Identification. It is understood that the Department of Motor Vehicles (DMV) referral will not be mandatory by government agencies but that there is likely to be some form of option available for those who come to notice through crash or violation involvement. The initial point of contact would be through the DMV when someone is called in for an assessment and would be required to undertake some form of computerised tests (there are a number of current projects sponsored by NHTSA to develop such a test or battery of tests and these are discussed further on in the review).
2. Screening. The screening procedure is not well developed at the moment but it is envisaged that it will be relatively brief, comprehensive, valid and functionally based computerised test. It is conceivable that the screening procedure could involve perceptual and cognitive competency tests, based on the best scientific evidence available and shown to be correlated with crash over-involvement. The format for the test will need to include *reasonable accommodation* for the abilities of older people (eg; it cannot presume computer literacy, for instance, when a high proportion of older drivers are not computer literate).
3. Review. The results of the screening assessment will then be reviewed with the participant. Those who "passed" will simply be permitted to keep driving or be issued a new licence. This could be subject to some restrictions (eg; no night driving or only within a certain radius of home) where a need is identified but this is still to be decided. The term of this licence, too, is also subject to further consideration. For those who "fail", they will be counselled to surrender their current permit voluntarily and cease driving and will be provided with alternative options for maintaining their mobility. It is expected that up to 75% of those who fail should be amenable to voluntary licence surrender based on recent evidence (Dobbs 1996b).
4. On-Road Testing. Extensive on-road driver testing would always be an option for anyone during the assessment procedure and would also be the final test of eligibility. It is anticipated that only a small percentage of those referred for assessment would undergo this test as it is likely to be time consuming and expensive. The on-road test format is being developed but there are a number of options under consideration and several current research programs which are aimed at developing a valid on-road driving test (nonexistent at present). Some of these tests are reviewed further on. There could be an option for a simulator, rather than an on-road test, as NHTSA are presently developing a high level facility capable of eliciting driving responses. However, whether this unit will be available for this purpose is unclear. From the evidence reviewed earlier, it is clear that an off-road test is not likely to be sufficient as a final screening procedure.

#### 4.4.2 Graded Licensing

Malfetti and Winter (cited Janke, 1994) apparently proposed a graded (graduated) licensing system which involves the introduction of certain driving restrictions as older people's abilities decline. This is a little similar to the concept of graduated licensing for inexperienced drivers, only in reverse. Restrictions could include no night-time driving, distance limitations on the amount of travel possible, restrictions to certain types of roads and limits on accompanying numbers of passengers. These restrictions would only be placed on the driver when they were shown to be less competent in particular functions such as vision, mental capacity, health and physical well being, etc. It is assumed that graduated licensing assessment would be done by licensing agencies but the possibility of self-assessment and self-restriction was also discussed.

The advantage of a graduated licence for older people would be based on exposure reduction without a complete ban on driving and would seem to have some merit. However, there are a number of issues that need to be raised over this proposal. First, it would only seem to have additional benefits if drivers do not *self-regulate* their driving exposure already. In addition, it would require regular re-licence testing for all older drivers which is likely to be very costly and with questionable cost-beneficial savings. Furthermore, the cost of administering such a scheme is likely to be even greater, given the range of tests necessary and the many administrative procedures required. Enforcement of many of the restrictions, too, would be difficult and this raises questions about the level of compliance. Finally, the system would be difficult to manage and would induce devious practices if it was not nationally consistent.

#### 4.5 SELF-REGULATION

The ability of older drivers themselves to regulate their driving according to their own abilities and to cease driving when they feel they are no longer able to drive safely is the key to whether to mandate compulsory re-licensing or not. It is commonly argued that most drivers are able to do this adequately (Eberhard 1996), although the evidence to support this is not strong. Dobbs (1996b) found that of 90 older drivers referred to the Northern Alberta Regional Geriatric Program, 70% were recommended to stop driving altogether, and half of the remainder, to restrict their driving. These people, however, were all referred by physicians and many of them were diagnosed as having clinically significant memory and cognitive dysfunctions so they were not necessarily representative of normal older drivers. Persson (cited Janke 1994) reported that 800;0 of older drivers living in a retirement village had stopped driving at night or in heavy or fast traffic to compensate for their physical declines. The crash reduction benefits of this could not be assessed thoroughly because of the lack of a sufficient number of cases.

More research is required to examine the incidence, process and effectiveness: of self-regulation. If, for instance, people most at risk such as those suffering some form of mental disability are also the least able to self-regulate, then clearly self-regulation will only be suitable for a proportion of the elderly population and some form of formal referral mechanism will also be required.

#### 4.6 ON-ROAD LICENCE TESTS

Most worldwide re-licensing procedures for older people are inadequate because they are unable to discriminating generally between good and bad drivers. Calls for an improved and integrated graduated licensing procedure for younger drivers have surfaced from a

number of countries including Australia (Cavallo and Triggs, 1996), incorporating more extensive learner driving under supervision and the development of a new test procedure based on current international best practice. Indeed, there are several research initiatives underway in Australia currently aimed at the identification of suitable test criteria for an improved graduated licensing system (GLS). If the present on-road licence test is deemed inadequate for screening new licence holders, it is equally inadequate as a re-licence procedure for older drivers. Indeed, one of the program development research priorities of NHTSA is to develop and evaluate a model "*graded licensing system*" to monitor and maintain the mobility of older drivers; that is, a form of reverse graduated license where people with reduced abilities are progressively restrained from driving, as necessary.

On-road driving tests conducted by licensing authorities for older drivers in Australia generally involve a routine licence testing procedure with special emphasis for the older driver. It is generally quite subjective and passing or failing is normally up to the discretion of the licence tester. A number of special driving tests aimed at recognising unsafe behaviour on the road have been or are being developed overseas and these are listed in Table 4.2 In addition, there are a number of various forms of driver tests designed and used by rehabilitators when assessing fitness to drive following major trauma. Unfortunately, though, very few of these special tests are ever correlated against crash performance, which is vital for these purposes. Further research is required here to establish their crash validity (it is hoped that this research will be undertaken by the developers over the next few years).

**Table 4.2 A number of special driving tests devised for older drivers**

TEST	SOURCE	VALIDATION	
		Behaviour	Crashes
Tucson Special Road Test	McKnight (1996)	yes	no
The Alberta On-Road Driving test	Dobbs (1996c)	yes	no
Harvard Medical School Driving Test	Odenheimer et al (1994)	yes	no
Sepulveda Road Test	Fitten et al (1995)	yes	yes <sup>1</sup>
University of Essen Driving Test	Schlag (1993)	yes	no
SDT California Driving Test <sup>2</sup>	Janke (1994)	no <sup>2</sup>	no <sup>2</sup>
Devon County Council Driving Test	Gimber (undated)	unknown	unknown

1. Validated against 2 year DMV driving record pre-test

2. Validation and reliability testing of this driving test are currently underway.

#### 4.7 PRE-DRIVING SCREENING TESTS

Janke (1994) has undertaken a very comprehensive review of screening tests used or potentially useful for screening older drivers. She notes three levels of screening tests, ranging from tests of simple sensory or perceptual abilities, complex perceptual and cognitive tests (attention, recognition, decision making, etc.) to psychomotor tests of physical abilities.

She notes that many of these tests have not been related to driving or crashes. Of those that have, most are validated against driving performance which makes their potential use as a screening device for crash risk difficult to interpret. The following discussion focuses on those tests which appear to be of more importance for screening driving ability of older people.

#### **4.7.1 Simple Vision or Perceptual Tests**

The most simple type of screening tests that have been used and in some cases validated against driving record or crash history are simple vision or perceptual tests.

**Static Visual Acuity.** The most commonly used visual screening tests are those frequently used by licensing authorities to assess static Visual Acuity (VA). Apart from the most simple and often abused Snellen Chart, there are a number of other VA testers that have been used by licensing agents such as the Optec 1000 vision tester used by the California Department of Motor Vehicles and the LOGMAR test developed by the Victorian College of Optometry. The Optec 1000 device tests foveal visual acuity and is used as a secondary test when an applicant fails an initial Snellen assessment (Janke 1994) but is not very accurate. It is understood that the Californian DMV is currently 'working on installing a letter slide which should measure acuity much more precisely. While Shinar (1977) reported that VA level was related to daytime crash rates per distance driven for those 55 or more and all crashes aged 65 plus, VA has not been universally accepted as a measure of crash risk (Burg 1967; Hills 1975).

**Dynamic Visual Acuity.** Dynamic vision can be assessed using the Optifield I and II but they are relatively costly and require some technical support. In recent unreported tests using the Optifield II by the Californian DMV (Janke 1994), it was found that the vast majority of renewal licence applicants (with good and poor driving histories) had few visual field deficits. Janke also noted that Johnson and Keltner found that subjects who had binocularly impaired visual fields as shown by the Fieldmaster 101-PR had higher crash histories so presumably this device has some promise. However, it is not clear how practical or feasible widespread use of the Fieldmaster 10 1-PR would be for screening dynamic visual acuity.

**Contrast Sensitivity.** Contrast sensitivity has also been associated as a risk factor for older drivers and is typically measured using contrast sensitivity charts such as the Pelli-Robson chart or the Melbourne Edge test. The former has multiple groups of upper case letters of constant size but at varying shades of grey against a white background and the subject names which letters they can see. The Melbourne Edge test is a series of half circles with edges at varying shades of grey and orientation and the subject nominates direction of orientation. Janke (1994) notes that the Pelli-Robson has been used by a number of investigators in validation studies and has been shown to be a good predictor of crash vulnerability. However, correlations are generally low compared 1:0 more sophisticated tests.

#### **4.7.2 Complex Perceptual & Cognitive Tests**

There are a range of perceptual and cognitive tests available that have been discussed in detail by Janke (1994) of which the more promising are summarised below in terms of what disorder they are likely to be useful screening tests for.

***Direction, Orientation & Visiospatial.*** Directional, orientation and visiospatial skills are important for driving and are often severely disrupted following a CV A or stroke. Janke (1994) lists a number of tests of these skills, some of which have been correlated with poor driving performance (eg; WAIS Block Design, the WISC Maze, and the Coloured Progressive Matrix test) but not crash involvement.

***Memory & Knowledge.*** Tests for memory or knowledge abilities are often used when assessing cognitive impairment through dementia and the presence of Alzheimer's disease. There are a range of these tests available such as the Boston Naming Test, WAIS Digital Span test, Weschler Memory Scales, Folstein, Mini Mental Status Examination, and the Short Blessed test. Most of these tests have been reported to be predictors of crash over-involvement by older drivers to varying degrees and each appears to be potentially useful as a licence screening technique.

***Attentional Characteristics.*** The ability to attend to the surrounding environment is likely to be important for older drivers and pedestrians alike and is degraded with age. Selective attention can be measured using embedded figure tests or the Road and Frame test and studies which attempted to correlate these with driver performance or crash outcomes have provided mixed results (see Janke 1994). The ability to maintain and/or switch attention or simultaneously process multiple sources of information seems to be also particularly important for safe driving. The Trail Making Test (Parts A and B) have been reported to be predictors of on-road performance (Odenheimer et al 1994) and crash involvement (Stutts et al 1996). Tests of vigilance (the ability to maintain attention in the presence of distractions) have been developed by Cushman and Tallman (cited Janke 1994) and apparently shown to be associated with road performance by older drivers. Laboratory tests of multiple processing ability such as the Stroop test, the Rod Alignment test of Somberg and Salthouse (1982), and the Approaching Car test of Triggs, Fildes & Koca (1994) are available but generally not in a suitable form for widespread screening use yet.

***Useful Field of View.*** The useful field of view is described by Ball and Owsley (1992) as "*the spatial area or visual field extent that is needed for a specific visual task*". This area supposedly varies from individual to individual 'where size is determined by sensory and/or cognitive capacity and ability to divide between central and peripheral tasks. The UFOV visual attention analyser models 2000, 3000 or 4000 are used to perform assessments and train clients to expand their useful fields of view and range in price from US\$15,000 to US\$30,000. A cheaper US\$1,000 computer program comprising a revised UFOV test is expected to be available soon. Ball and Owsley (1991) reported that UFOV and mental status were both significantly correlated with intersection crash risk and with each other but that UFOV was the more sensitive measure. Interestingly, UFOV is not related to eye health status and both measures together could only account for 20% of the crash variance. They note that the UFOV test is currently really a research tool rather than a widespread screening method as it is expensive and requires specific technical competence with the device. Development of a more simple measure such as the pending computer software program may improve the usefulness of this measure for licence screening.

***Hazard Perception.*** A number of off-road simulations to test individual's abilities to perceive road hazards are currently available. Janke (1994) reviewed a number of these including Quimby's Hazard Perception test, the AGC (now Doran Precision Systems Inc.), Doran and Elementary Driving simulator tests, TestCorp Pre-Road Battery test, Easy Driving and the STISIM test. These tests involved varying degrees of off-road driving simulation using either a laboratory set up, a games parlour display, computer programs or

full scale driving simulators. Of these, the relatively sophisticated AGC simulator test was the: only one that seemed to correlate well with impaired driving performance and crashes but did: require a high degree of simulation. (The STISIM test was also promising for predicting cognitive impairment but requires further testing). The AGC simulator test uses a 3 or 5 screen display that is completely interactive. While the California and Oregon DMVs are supposedly exploring the feasibility of using this system for testing drivers (Janke 1994), the cost effectiveness of using full scale driving simulators for these assessments still needs to be established. Questions of simulator sickness among older drivers have not been adequately addressed at this time.

**Cognitive Screen (Battery) Tests.** Researchers such as Dobbs (1996c) have argued that screening needs to comprise a battery of suitable tests, rather than rely on anyone single test. He proposes that the battery needs to include a range of assessments for vision, reaction time, memory, gap and attention, recall and driver performance variables. To date, this work is exploratory and has been correlated with driving performance with an on-road specialised driving test. It is understood that future research will attempt to correlate both these tests (the screening battery and the on-road tests with crash involvement).

The Automated Psychophysical Test (ATP) by the National Public Services Research Institute (McKnight, 1996) is aimed at developing a computer interactive test for screening at-risk older drivers. The test is run on a desktop computer using a joystick and has a lot of promise for being a practical useful screening tool. It is currently being validated against driving performance for older drivers and the results appear to be promising (personal communication by McKnight). However, it seems that there is no intention at present to validate the program against crash involvement which poses a problem for demonstrating its usefulness as a safety screening procedure.

#### **4.7.3 Psychomotor Tests**

Tests of psychomotor performance are thought likely to be useful ways of highlighting motor deficiencies through impairments such as vision deficiencies and arthritis. Ocular pursuit, neuromuscular tests for strength and flexion, eye-hand coordination tests, motor skill assessment tests and grip strength were reviewed by Janke (1994) as tests available for assessing psychomotor performance. However, from the studies she reviewed, there was a general lack of empirical evidence relating the levels of test function with driver performance and safety.

In a postscript, Janke argued that while many of the tests she reviewed showed some promise for predicting driving performance, they failed to predict differences in performance within groups of people with dementia (these tests were much better in simply distinguishing the demented from the normal older person). In addition, she argued that many of the evaluation studies were flawed or biased in one way or another and it is difficult to draw general conclusions from these. She noted that actual driving test performance might still constitute the best predictor of driver competence.

#### **4.8 MANAGEMENT & RESEARCH OVERVIEW**

It is clear from the material reviewed in this section that the question regarding the need for older driver re-licensing requirements is extremely complicated. The most promising management model at this time seems to be for self-regulation with capacity and facilities for testing those who fail to cease driving when they should and are reported to a licensing authority through various community mechanisms. However, there are a number of areas

for which further research is either currently underway or still required to clarify and address a number of important issues.

Specifically, there is an urgent need for effective screening tests for initial assessment of those referred for licence examination as well as effective driving (or simulated driving) tests before any mandatory re-licensing program should be seriously considered. The need for supporting publicity and educational materials is discussed in the next section.

#### **4.8.1 Research & Development Needs**

A number of research needs were alluded to during this section of the review. These are listed here in point form in no set order of importance.

- An evaluation of differences in older driver crash rates across the various states and territories in Australia (and possibly New Zealand) to examine the effects of existing licensing requirements on crash frequency.
- More information about the incidence, processes adopted and effectiveness of self-regulation of modifying driving behaviour or cessation of driving including demonstrating whether those most at risk are able to make rational decisions to stop driving.
- A re-analysis of the likely costs and benefits of mandatory licence re-testing in Victoria, involving various scenarios of re-licensing periods, age thresholds, and expected older driver exposure rates. This might also include the cost-benefits of graduated licensing as an optional form of mandatory re-licensing.

Results from this research would provide useful data on the desirability of Victoria continuing to retain a self-regulation model for older driver licensing and/or demonstrate the need for more stringent requirements. Additional research topics below relate to the development of this model.

- Participate in the development of effective screening tests for highlighting those likely to be at greater risk. While much of this research effort is currently happening overseas, there may be a need for closely monitoring these results and additional local research effort where it is evident that Victoria or Australia can effectively contribute to these efforts-
- Participate in the development and evaluation of simulation and on-road driving tests that effectively highlight behavioural abnormalities that put older people at risk of accident. Again, this will require monitoring current R&D projects overseas and undertaking specific studies in this country where required

## 5.0 OTHER RELATED ISSUES FOR OLDER DRIVERS

A number of other issues regarding older driver safety, licensing and alternative means of mobility arose during the course of the review and these are discussed further in this section. The underlying assumption here is that mobility and maintaining an active social life is of paramount importance for older people in terms of their health, quality of life and psychological well-being, and that they should not be penalised because of age-related disabilities. Indeed, a number of studies have demonstrated that life itself can be severely compromised by the lack of social interaction and mobility among older people.

### 5.1 THE LICENCE AS A STATUS

The driving licence is intended primarily as a permit to drive a vehicle. However, the licence has evolved into serving a number of alternative purposes, too, such as a means of identification when opening bank accounts, seeking credit or applying for other services. Moreover, it has another more subtle purpose in that to a number of older people, it represents a passport as a healthy normal member of society. In a recent survey of older drivers and pedestrians in two major capital cities in Australia, it was revealed that ~52% of all older people who classified themselves as "predominantly pedestrians" still held a current driving licence (see Figure 5.1). This was particularly so for males, where 35% of men aged 81 years and older never drove but still maintained a current driving licence.

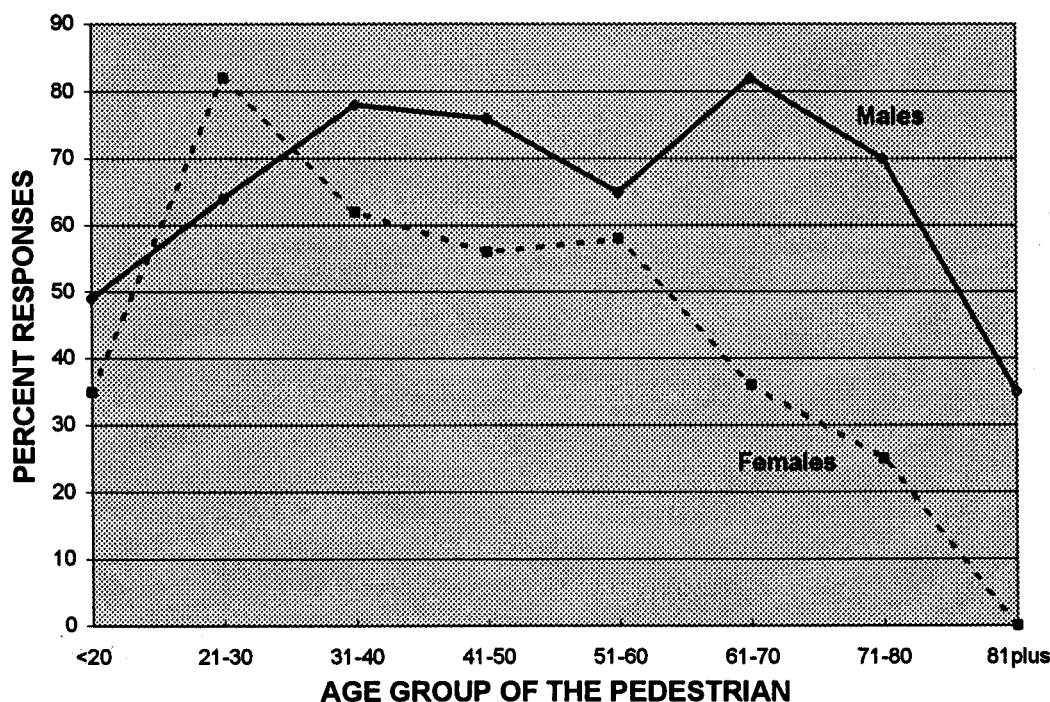


Figure 5.1 Pedestrians still holding a licence  
(from Fildes, Lee, Kenny & Foddy 1994)

The State of Connecticut in the USA have introduced a Personal Identification Card as an alternative identification (with photograph) to the driving licence for those who no longer drive. It is understood that other US states also have equivalent systems and similar to the Personal Identification Card available for young adults in Victoria. The encouragement of the use of these cards for older Victorians would seem a useful initiative.

However, while these cards might effectively overcome the identification role of the driving licence for older people, it is not known how well accepted they are within the general community or whether they also overcome the loss of social status associated with surrendering one's licence. More research is wanted to understand this phenomenon better.

## **5.2 EXPOSURE REDUCTION**

It is commonly believed that older drivers compensate for their degraded driving skills by reducing their exposure through driving less, not driving at peak traffic times, not driving at night and minimising their time on major arterials. The survey by Fildes, Lee, Kenny and Foddy (1994) reported that weekly travel distances by drivers 65 years and older was only 75% that of younger adults and reduced even further, as age increased. Furthermore, older drivers also reported a greater tendency to travel at non-peak times and less often at night.

The survey, however, did not attempt to discriminate between groups of older drivers, especially those who are likely to be "at risk". The degree to which these older drivers compensate by exposure reduction is not clear and this would seem to be an important issue in deciding the benefits of mandatory licence re-testing. Further research is warranted in assessing the exposure reduction behaviour of various types of older drivers. A pilot study of driver reduction practices is currently being funded by the American Association of Retired Persons (AARP) and is worth monitoring (Berger 1996).

## **5.3 STOPPING DRIVING**

Understanding the processes leading up to an older driver deciding to stop driving is important for providing advice and possible future initiatives and was alluded to in the previous section. A research study is currently underway by the New York State Office for the Aging (LePore, 1996) to examine the processes frequently involved in an older drivers decisions to stop driving. They intend publishing a handbook at the completion of their research advising on strategies for stopping driving. .

Berger (1996) noted that there are often subtle signs obvious when a person is approaching the time to stop driving. These include an increase frequency in minor vehicle damage (from colliding with posts, walls, etc, often without the drivers knowledge), peers and family members not wanting to travel with the older driver (including restricting children from travelling with their grand parents), and family and peers choosing to drive when they travel with at risk elders. Often, too, older people themselves can apply restrictions by not allowing others to travel with them. Understanding these details is important for educating both older and younger drivers in strategies to improve the safety of older drivers.

Dobbs (1996b) reported on a study she had conducted in Alberta, Canada of 90 people who had been referred to the Department of Motor Vehicles for assessment of their driving abilities, either by their families or by self-referral. Seventy percent were subsequently recommended to stop driving. Of these, three-quarters claimed to be unaware of their need to stop, although once advised to do so, the vast majority complied immediately. However, 20% of those recommended to stop still continued to drive afterwards. She noted that little research has been conducted on the psychological, social and economic consequences of an older driver stopping driving and called for more research in this area.

## 5.4 MOBILITY OPTIONS

One thing that is clear is that mobility for the aged is a very important issue for society and one that will only get stronger with an increasing proportion of mobile older persons. It will be difficult to deny these people the right to drive without the provision of acceptable alternative means of transport. A number of existing and proposed options became apparent during the course of this review and are included.

### 5.4.1 Public Transport

The most obvious choice of alternative mobility to the car is public transport (buses, trains, trams, etc) normally provided in most cities. However, there are a number of problems with public transport for older people, including availability, personal safety and discomfort, inconvenience, etc. Night-time travel on public transport is practically out of the question for most older people in other than high density and very secure services. Moreover, many older people report great difficulty in getting on and off public transport (especially buses and trams; Fildes, Lee et al, 1994) and fear the surrounding traffic, and hence, curtail their excursions. With fewer available resources, many older people also move out into outer suburban areas upon retirement where public transport services are less available, thereby restricting their public transport options and having to place more reliance on the car.

Some local communities have attempted to overcome these problems by providing special community bus services for the elderly and disabled. These can operate either on a regular pre-booked schedule or occasionally on an “*on-call*” basis. Unfortunately, with recent restrictions in health and local government funding, many of these existing services are disappearing. No documented evidence was found on the use and user reaction to these services and this would seem to be one area where further research would be warranted.

### 5.4.2 Private Transport

Taxis are an obvious form of private alternative transport and generally available. However, many older people do not like using taxis as they have limited resources, are unaccustomed to the regular use of taxis and often feel quite vulnerable and unsafe in a car driven by an often quite young stranger. There are schemes available to provide discount rides for older people in taxis but these are frequently restricted to financial hardship cases or severely disabled passengers.

In examining alternatives to older people driving themselves, Freund (1996) reported that 80% of transport dependent older people surveyed relied on family members for their transport needs, often the daughter as she is more likely to be available. However, three-quarters of them said that they don't like this arrangement and around half of these noted a general reluctance to ask, preferring to stay at home unless absolutely necessary. Interestingly, 18% claimed that they could not always rely on the family for their travel needs. Most family members consulted also reported difficulty providing this service for their ageing family members given other demands on their time (especially those with children). She noted the need for agencies and policy makers to be sensitive to the needs of older people who have been accustomed to private transport, notably the car.

Straight (1996) argued that there is a general lack of policies in the USA and other countries on providing alternative transport for older people. She reported on a pilot study underway in Portland, Maine by the Independent Transportation Network (ITN) where fit older

people volunteer to provide rides for less able senior citizens. ITN acts as the coordination Centre and matches volunteers with seniors who need rides. Users pay a small annual joining fee and there is a range of different mechanisms for paying a modest fee for each ride they book. Trips are usually booked 24 hours in advance but there are provisions for more urgent bookings as well. The ITN pilot program has met with considerable success and the use of older people as chauffeurs seems to have overcome the natural uneasiness with taxi drivers. Straight noted the need for (1), information on available resources, (2), public policy aimed at encouraging private investment in this area, and (3) the need for quality of service and accountability. She identified a number of areas where further research was required, namely:

- quantitative data on unmet transportation needs (survey of older people's travel requirements which are both met and unmet);
- economic analysis, based on differing geographic situations;
- survey of older people's travel preferences;
- analysis of the processes leading to driving cessation;
- proportion of older people who stay at home when unable to get their preferred mode of travel for a planned journey;
- the degree to which transportation needs influence decisions on where to live latter in life (and also where transport leads to a decision to move home); and
- barriers to transportation and meeting the needs of older people.

## **5.5 SAFE PACKAGING**

A number of researchers noted the need for passive safety technology to accommodate the needs for older road users. This is particularly important, given their greater susceptibility to serious injury and death in a crash. Greater attention needs to be given to occupant restraint for elderly people (drivers and passengers) as current seatbelt systems and airbags may be more injurious to older than younger adults. Intelligent restraint systems which are currently under development should be capable of adjusting to the age of the occupant. In particular, airbags that can adjust to the seating position and frailty of the occupant would seem to be important and possibly deformable links in seatbelts. As many older people purchase a new car on retirement to "see the", out", there is an opportunity for manufacturers to offer a special elderly safety package to accommodate older people's safety needs. Head protection in cars needs to be emphasised especially for older people and the availability of special equipment such as helmets and airbelts for the elderly would be beneficial for these vulnerable road users for those who are willing to use them.

## **5.6 HIGHWAY DESIGN FOR OLDER DRIVERS**

Highway design manuals (eg; AASHTO, 1984; NAASRA 1980) outline design criteria for the geometric design of roadways, based on available literature and sound engineering principles and practices. For the most part, these criteria are set for the normal or average driver, presumably fit and relatively healthy adults. Little, if any, consideration is: made for drivers with disabilities, including age-related sensory, cognitive, physical and health

disorders. Yet these disorders markedly affect an older driver's ability to interact with his or her environment. Poor vision, for instance, will degrade the visual scene presented to a driver while cognitive impairments will necessitate greater response time to unexpected stimuli. Consequently, these road users are at greater risk of not seeing or mis-reading environmental cues, placing themselves at greater risk of collision. Johnston (1983) acknowledged this for alcohol impaired drivers when he argued for more forgiving road design to offset alcohol impairment.

What is needed is recognition of the older driver in many aspects of road and highway design. The Federal Highway Administration in the USA have been working towards a Highway Design Manual with recommendations covering intersections and interchanges, roadway curvature, passing zones and construction and work zones that take account of the special needs of the older driver (FHWA 1997).

Traffic engineering measures including larger and high-contrast road and street signs and improved lighting requirements to accommodate the needs and restrictions of older people with failing eyesight who are also less likely to scan the driving environment are also likely to be important. Older people, too, complained about the lack of consideration given to their special needs in road signing, lighting conditions, merging lanes, pedestrian crossings, and pavement surfaces (Fildes, Lee, Kenny & Foddy 1994).

There is clearly an urgent need to review highway design standards in Australia in terms of meeting the needs of older drivers in the years ahead. It is worth noting that while many of these initiatives may be more relevant for the elderly, they are also likely to be of some added benefit for all road users and unlikely to have undesirable road safety consequences.

## **5.7 INFORMATION, TRAINING AND ADVICE**

The need for information, guidance and training materials for older drivers is critical for ensuring that they are aware of the dangers they face and steps they can take to reduce the risk of having a crash. Materials that are currently available are reviewed below, along with recommendations for new or upgraded materials where necessary. A summary of existing materials for older Victorian drivers is included in Table 5.1.

### **5.7.1 Older Drivers Handbook**

An important service provided by road safety authorities is the provision of information to older drivers on various aspects of ageing and how it likely affects their driving abilities.

The easiest way of providing this information has been in publishing Older Driver handbooks which a number of Australian states and territories have attempted or are planning.

**Table 5.1 VicRoads Publications for Older Drivers**

<b>Title</b>	<b>Year</b>	<b>Target Audience</b>	<b>Purpose</b>	<b>Materials</b>
Play It Safe	1989	Older Adults	Promote sound road use practice	Video
Comfortable Driving & the Mature Driver	1995	Older Drivers	Information for older drivers	Brochure
Drivers with Medical Conditions	1995	Older Drivers	Information for older drivers	Brochure
Roadworthy Cars and the Older Driver	1995	Older Drivers	Information for older drivers	Brochure
Vision and Older Drivers	1995	Older Drivers	Information for older drivers	Brochure
Everyday Exercise for Older Adults	1995	Older Drivers	Information for older drivers	Brochure
Exercises to Avoid	1995	Older Drivers	Information for older drivers	Brochure
Health and Senior Drivers	1995	Older Drivers	Information for older drivers	Brochure
SafeDrive	1996	Older Drivers	Workshop Presentations	Information Kit

The ACT Department of Urban Services (Transport Regulations) first published the ACT Older Drivers' Handbook in 1995 which contains valuable information on safe driving practices, health and physical well-being, emotions, tell-tale ageing indicators, regulations licence codes and alternative transport services. Importantly, they also included a self-assessment for older drivers to test their own safe driving abilities. Most of the information seems to be current and the handbook is widely distributed. It is understood that an evaluation of its reader acceptance and safety benefits has not been undertaken to date.

VicRoads are about to prepare a similar publication for older Victorian motorists which is expected to be completed during the 1997/98 financial year.

### **5.7.2 The SafeDrive Program**

Vic Roads have developed a preliminary SafeDrive Program for older drivers to alert them to the dangers facing older motorists and to ways in which they can reduce their risks on the road. The program involves a series of slides and lectures which is transportable to suitable elderly groups on request. It is understood that the SafeDrive program is currently being assessed and simplified to make it more accessible and useful for the target group.

The Roads and Traffic Authority of NSW have also produced a Safe Seniors kit containing a 10 minute video on "*Driving For Keeps*" which is also intended for group presentations. This video and the accompanying brochure provides a number of useful hints on road safety. We understand that the effectiveness of these materials on influencing older drivers behaviour has not been thoroughly assessed.

### **5.7.3 Fitness to Drive**

There have been several international publications outlining criteria for assessing a driver's fitness to drive. Some of these documents are complex and difficult to read and often are compiled with less than up-to-date information on accident risk factors for older drivers.

*AUSTROADS* is in the final stages of preparing a fitness to drive manual intended to outline guidelines for health professionals and their legal obligations as well as provide a range of supplementary information such as legal BAC limits by state, disabled parking and taxi services, a listing of state licensing authorities and medical condition reporting forms. It is hoped that the national guidelines will provide health professionals with consistent information to ensure consistency in dealing with patients with degraded driving abilities and encourage them in playing a more active role in encouraging unfit older drivers: to cease driving where necessary. The degree to which GPs and other health professionals will participate in stopping "at risk" older people from driving needs to be carefully monitored.

### **5.7.4 Alternative Forms of Transport**

As noted earlier, a reliable, safe and accessible public transport system is essential for older people's mobility. However, this will not always suffice especially in out of the way and rural areas and it is important to provide additional forms of private transport to ensure older people's mobility. Very little information, however, was found on the availability of these services or who to consult for this information, locally.

Family members often provide transport for their ageing relatives but this is ad hoc: and does not constitute a formal community service. Supplemented taxi schemes are sometimes provided for the elderly, especially those who are more disabled, but these are becoming more restricted and many older people do not feel particularly safe in taxis. Community bus services, often with front door service, have been provided by local councils in the past but these have also become less common as local governments are forced to look at ways of reducing cost. Some local councils and voluntary agencies also provide these services but these tend to be more an "ad hoc" facility.

As noted earlier, private systems are being trialed in the USA such as the Independent Transportation Network (ITN) in Portland where volunteer healthy older people transport those who are less fit and healthy for minimal cost to the user. These systems would seem to offer considerable promise for the future and be worthy of a pilot project in this country too to demonstrate their feasibility and user acceptability. A local network of where to go for alternative transport would be an invaluable reference source for older people who are unable or unwilling to drive.

### **5.7.5 Retirement from Driving**

The whole question of self-regulation of older drivers is an interesting one that requires closer attention if the community is to make rational and effective decisions about re-licensing and mobility needs for older people. No information was found of materials aimed at helping older people unable to continue to drive out to exit from driving. The proposed New York State Office handbook on how to advise "at risk" older drivers to retire from driving would seem to be a valuable resource for helping develop strategies for older people retiring from driving. There would seem to be considerable merit in developing or adapting this handbook to suit older Victorian drivers.

### **5.7.6 Guidelines for Licence Referral**

There have been numerous calls for health professionals to play a more active part in advising older drivers of their risks and the need to stop driving. Publications specifically providing information or recommendations for these professionals to use in judging when someone is at risk and procedures they should follow are needed.

The new national guidelines for assessing fitness to drive by AUSTRROADS hopefully will address this to some degree. VicRoads are presently designing a SafeDrive Medical kit to ensure that health professionals who treat older drivers are aware of the latest research and treatments and their ethical requirements. These materials also need to include licensing authority requirements and any proposed changes to existing legislation.

### **5.7.7 The Role of the Health Fraternity**

Sound advice for the Health Fraternity to help them assess an older person's ability to continue to drive is also necessary. Hull (1997) made a number of sensible suggestions in this regard during a recent coronial inquiry, including:

1. that VicRoads further encourage education of at risk drivers and the medical profession on the possibility of increased risk of a crash for drivers with advanced stages of relevant natural disease processes;
2. that VicRoads examine the feasibility of providing all option for drivers with an increased crash risk through natural disease to be licensed to driver for a lessor period than 10 years;
3. that VicRoads investigate the feasibility of encouraging intern training schemes in hospitals to increase appreciation of the relationship between patient health issues and road safety with particular emphasis on individual as well as general community health;
4. that Hospitals and Day Surgery Centres be encouraged to ensure that patient discharge documentation includes formal specifications regarding fitness to drive and that this information be communicated to the patient's general practitioner;
5. that VicRoads consider sending to older drivers with their licence renewals a brochure advising them of health factors that may adversely affect their driving abilities; and
6. that the health personnel assume, as a matter of course, that patients be allowed to continue to driver unless they believe to the contrary that the person poses an unacceptable safety risk to themselves or to other road users;

### **5.7.8 The Need for Evaluation**

The effectiveness of all road safety materials needs to be evaluated in terms of what it is attempting to achieve. Evaluations can vary from the ability of the materials to convey information accurately and concisely to their impact on changing behaviour or reducing crashes. While there is always a need to inform people of the road safety risks they face and ways of minimising or reducing their own risk, ultimately, it is hoped that this information transfer will lead to fewer road accidents. Thus, these materials need to be constantly under review in terms of whether they are effective and whether there is a need to up-date them.

## 5.8 RESEARCH & MANAGEMENT ISSUES

The review of associated older driver issues has illustrated the need for a number of new management and research initiatives and these are summarised in point form below.

- Examination of the feasibility and potential usefulness of a Personal Identification Card (PIC) for older people as an alternative to the driver licence.
- Further research into the extent of reduced driving and strategies adopted by older people to reduce their driving exposure. This should include assessment of the individual's own perceptions of the driving abilities as well.
- Understand the processes involved in older drivers deciding to stop driving altogether and not renewing their licences. This could be an extension of the previous research topic or a separate topic altogether. It would be worth monitoring the research currently planned in New York as a guide to the need for additional Australian research.
- Research into the availability and acceptability of alternative forms of transport for older people. Many of the research topics identified by Straight (1996) listed in section 5.4.2 would be pertinent to this research effort. The acceptability to older people of alternative forms of transport (especially by geographic location and economic circumstances) would also seem worthwhile. The feasibility of a phone-in service to tell the inquirer how to get from A to B would also seem to be worthy of further consideration.
- Undertake a feasibility study of highway design requirements and environment measures that could be employed to improve older driver safety;
- Investigate the social effects of stopping driving on older people's health and wellbeing.
- Development of policies and techniques to promote greater attention to passive: safety for older passenger car occupants in Australia.
- Specific advise to the health fraternity and older drivers themselves on the role of health conditions and crash risk.
- Establish a support/assistance program for older people who stop driving to assist in the transition from driving a vehicle to using alternative transport;
- Provision of additional information and training materials as outlined above, including a thorough evaluation of the effectiveness of any training schemes for older drivers.

## 6.0 RESEARCH & MANAGEMENT PRIORITIES

The final phase of the review was to bring together the various research and management or action items identified into a comprehensive list and to rank these in terms of their importance for the community in improving road safety.

### 6.1 RANKING PROCESS

It was considered important that a wide selection of views on priority was necessary to ensure that the final rankings reflected a consensus viewpoint, rather than that of anyone single agency. Hence, a team of people with expertise on older drivers was sought to assist with this procedure and these are listed below in Table 6.1. In addition, a number of international specialists also agreed to participate in this ranking process and they are listed in Table 2. It was felt important to contrast the Australian views with those from overseas to gauge what were local and international issues. These people represented a range of different interests from researchers, government agencies, and community groups and involved representatives from Victoria, interstate and overseas organisations. The author is especially grateful to all those who willingly agreed to help out with this important task.

**Table 6.1 Panel of Australian specialists who participated in the priority ranking task**

REPRESENTATIVE	AGENCY	ORGANISATION
Samantha Cockfield	Government	Transport Accident Commission of Victoria
Snr Sgt Greg Deimos	Government	Victoria Police, Victoria
Michael Hull	Government	VicRoads, Victoria
Robert Klein	Government	VicRoads, Victoria.
Jim Langford	Government	Dept. Transport, Tasmania
Margaret Smythe	Government	Federal Office of Road Safety, ACT
Graeme Vaughan	Government	Department of Justice, Victoria
Michael White/Trevor Bailey	Government	Office of Road Safety, SA
Ben Witham	Government	Human Services, Victoria
Anne Harris	Community	RACV Limited, Victoria
Judy Elsworth	Community	HCES
Sam Berkovic	Research	Neurological Medicine, Austin & Repat. Hospital
Barry Elliott	Research	Elliott, & Shanahah Consultants, NSW
Brian Fildes	Research	Monash University Accident Research Centre
Wendy McDonald	Research	Latrobe University, Victoria
Peter Vulcan	Research	Monash University Accident Research Centre

**Table 6.2 Panel of International specialists who participated in the priority ranking task**

REPRESENTATIVE	AGENCY	ORGANISATION
John Eberhard	Government	NHTSA, Washington, USA
Leo Tasca	Government	Ministry of Transportation, Ontario, Canada
Arlene Berger	Research	Ecosometrics, Inc.
Mary Janke	Research	Dept. Motor vehicles, California, USA
Richard Marottoli	Research	School of Medicine, Yale University, CT.
Loren Staplin	Research	The Sinetex Corp., Kulpsville, PA.

## 6.2 PROCEDURE

Two lists were prepared of all items that had been identified during the review as issues requiring either further research or management action. The lists contained a brief description of each item, a range of possible techniques available to address each item, and what the likely benefits would be if they were implemented. The final lists contained 15 Research and 12 action or management items, listed on separate spreadsheets. The spreadsheets developed for this ranking exercise are contained in Appendix 1 to this report.

The two lists were distributed independently to each of the experts with instructions about how rate each item on a scale from 1 to 5 depending on their judgement of that item. Participants were asked to make their judgements based on how important they or the organisation they represented believed each item was for greater knowledge or improved safety management. They were asked to respond **5** if they felt that the item was *very important* and **1** if they thought it *less important* and were encouraged to spread their judgements wherever possible between these two extremes.

An earlier exercise had attempted to rank these items in terms of their importance, feasibility to undertake, and perceived value to the community. As the rankings were remarkably similar and offered little extra information, it was decided ultimately to focus exclusively on the importance each participant placed on these items.

Respondents were given approximately two weeks to make their judgements and were also provided with draft copies of the review to help explain the background behind each of the research and action items if required. They were encouraged to make their judgements independently of any other person undertaking the ranking. Responses were returned to the Centre and assembled into a group response matrix for both categories of items.

## 6.3 RESULTS

The respondents comprised four possible organisation categories or interest groups, namely government authorities, researchers, community groups, and overseas representatives. The responses were analysed both overall and within the four interest groups. While the numbers in each of the groups was rather small, nevertheless, it was felt: to be of additional interest in that it reflected differences in the priority each organisation or interest group might place on particular issues relating to older driver safety.

Table 6.3 Summary of the Research Priority Rankings from the Older Driver Strategy Review

PRIORITY	RESEARCH ITEM	AVERAGE SCORE	SCORE DISTRIBUTION					REPRESENTATIVE GROUP PRIORITIES			
			1's	2's	3's	4's	5's	Gov. (n=9)	Community (n=2)	Research (n=5)	Overseas (n=6)
1	Continued monitoring of crashes	1.5	15	4	2	1	0	1	3	1	4
2	Self-regulation process	1.9	9	9	3	0	1	6	5	4	1
3	Develop suitable screening tests	1.9	8	9	3	0	1	2	12	5	5
4	Highway design for older drivers	2.0	10	5	2	2	1	4	2	8	3
5	Crash causation by older drivers	2.1	7	8	5	2	0	3	4	3	10
6	Collection of exposure data	2.2	5	9	7	1	0	5	8	7	8
7	Health & impairment risk analysis	2.3	4	11	2	4	0	7	9	9	2
8	Develop suitable driving tests	2.3	6	8	4	3	1	10	15	2	7
9	Alternative forms of transport	2.6	7	5	4	1	5	14	1	12	6
10	Raise health & impair. awareness	2.7	1	8	8	4	0	8	11	13	9
11	Intelligent safety technology	2.8	4	7	4	4	3	9	10	15	12
12	Older driver graduated licensing	2.9	3	8	2	7	2	13	13	6	14
13	Re-licensing costs & benefits	3.0	1	5	10	6	0	12	14	10	11
14	Analysis of crash rates	3.1	2	3	10	4	3	11	6	14	13
15	Driver-pedestrian risk trade-off	3.3	2	4	5	6	4	15	7	11	15

Note: Research items listed from top to bottom in order of overall priority. Respondents scored 1 for items judged to be very important and 5 for those not very important, and were encouraged to use all 5 points on the scale. An item with a low average score, therefore, was judged to be more important than one with a higher score. The score distribution shows the number of respondents who marked a particular item either 1, 2, 3, 4 or 5. The priorities for each group (eg. government agencies, community groups, researchers and overseas agencies) are shown on the right-hand side of the table.

### 6.3.1 Research Priorities

Table 6.3 shows the summary of responses for the research priorities, listed in terms of their perceived importance, averaged across all respondents. The distribution of scores across the 5 response categories is shown to the left of the average scores. In addition, the perceived importance of each item for each of the groups represented is also shown on the right-hand side of the table. The main findings are discussed below.

The top six priority research items averaged across all respondents were:

1. the continued monitoring of crashes involving older drivers;
2. to examine the ability of older people to self-regulate their driving behaviour;
3. the development of adequate screening tests for older drivers;
4. the suitability of highway design for older drivers;
5. to examine the role of older drivers as a cause of road crashes; and
6. the collection of comprehensive exposure data on older drivers road usage.

There was high agreement across all groups of the importance in continuing to monitor crashes and the need to undertake more analysis of the role of older people in causing crashes. In addition, most groups saw a need to better understand the processes and extent by which older people self-regulate their driving behaviour and licensing practices. Government officials and researchers felt it was important to develop better screening (and driving) tests to determine older driver's abilities to continue to drive safely. Better exposure data, too, was considered necessary by many of the respondents.

The need to consider older drivers more in highway design was rated reasonably high by many of the respondents. As pointed out in the review, traditional design manuals do not specifically take ageing disabilities into account in designing roads and roadside furniture.

Signing and delineation, for example, can be adversely affected by poor vision and consequently place older drivers at greater risk. Stopping them from driving is not an adequate solution as there are a number of traffic engineering countermeasures that can alleviate this problem. Indeed, enhancing road signage and delineation treatments is also likely to be of benefit to other impaired drivers, too. There is clearly a need for further research to identify how road design can be modified to advantage these road users.

There was considerable agreement in the top order priority expressed between the Australian and overseas representatives, showing that many of the problems identified in Australia are not particularly unique to this country. This demonstrates the need for closer collaboration in research effort between Australia and overseas countries to optimise the use of scarce research resources in older driver research. Collaboration would be facilitated by Australian membership of select overseas older driver research committees as well as by participating in international meetings dealing with older driver issues. As there have not been any recent international conference which specifically address older driver research projects and recent findings, it could be advantageous for Australia to assist in staging such a major international conference in the near future. This would help to seek out opportunities by which Australia could profitably participate in future research effort in this area.

Other areas worthy of further research that did not rate highly overall but were singled out by particular groups included costs and benefits of re-licensing, desirability of graduated licensing for older people and alternative forms of transport (this latter item is really one requiring action rather than more research).

Table 6.4 Summary of Action Priority Rankings from the Older Driver Strategy Review

PRIORITY	ACTION ITEM	AVERAGE SCORE	SCORE DISTRIBUTION					REPRESENTATIVE GROUP PRIORITIES			
			1's	2's	3's	4's	5's	Gov. (n=9)	Community (n=2)	Research (n=5)	Overseas (n=6)
1	Guidelines for licence referral	1.8	10	7	1	1	1	2	6	1	1
2	Pilot model re-licensing program	2.2	7	7	4	2	1	3	10	2	2
3	Older driver handbook	2.3	4	11	2	1	2	6	5	3	3
4	Retirement from driving handbook	2.3	4	10	2	1	2	4	7	4	6
5	Medication labelling improvement	2.4	6	7	4	2	2	5	3	7	5
6	Highway design manual (O.D.)	2.4	6	6	1	5	1	1	8	5	12
7	Alternative transport policy	2.5	6	7	2	3	3	7	1	9	8
8	Alternative transport manual	2.7	3	8	5	2	3	10	9	6	4
9	Health impairment scale	2.8	2	5	10	3	1	8	4	10	7
10	Innovative training course	2.9	3	4	8	4	2	11	2	11	10
11	Passive safety features in cars	3.0	5	5	0	6	4	9	11	8	9
12	Personal Identity Card feasibility	3.4	3	4	3	4	7	12	12	12	11

Note: Action items listed from top to bottom in order of overall priority. Respondents scored 1 for items judged to be very important and 5 for those not very important, and were encouraged to use all 5 points on the scale. An item with a low average score, therefore, was judged to be more important than one with a higher score. The score distribution shows the number of respondents who marked a particular item either 1, 2, 3, 4 or 5. The priorities for each group (eg; government agencies, community groups, researchers and overseas agencies) are shown on the right-hand side of the table.

### 6.3.2 Management (Action) Priorities

Table 6.4 shows the summary of responses for the action or countermeasure priorities, listed in terms of their perceived importance averaged across all respondents. The distribution of scores across the 5 response categories is shown to the left of the average scores and the perceived importance of each item for each of the groups represented is again shown on the right-hand side of the table. The top six action items averaged across all respondents were:

1. improved guidelines for licence referral;
2. the establishment of a pilot re-licensing program, similar to that proposed by the National Highway and Traffic Safety Administration in the USA;
3. preparation an older driver handbook;
4. a handbook providing advice and recommendations on how to retire from driving;
5. improved medication labelling for drugs that adversely affects driving ability; and
6. provision of a manual on highway design for older drivers;

There was good agreement from the various government, research and overseas representatives for these top priority items. Community group priorities were quite different where they called for alternative transport policies, re-training courses and a health impairment scale. Government agencies particularly saw a real need for a highway design manual. As noted earlier, though, this may need to be preceded by a research program aimed at identifying some of these characteristics.

There was some divergence among the groups of need for more educational materials. This could be simply explained by a lack of knowledge by all participants about measures currently in progress (eg; there is an older driver handbook currently being developed by VicRoads that not all respondents would have been aware of). Conversely, it might also reflect some disenchantment with current materials available in this area.

Improvements in medication labelling of the adverse effects on driving was perceived to be more of an issue by local community groups as well as the overseas agencies. Clearly, it is important for prescriptive medicines to be properly labelled concerning their adverse effects on driving but this was not rated highly among government officials. This might suggest that there is a need for further research to demonstrate its role in crashes and ways in which this labelling might be improved. In short, this may be more a research item at this stage, rather than one immediately applicable for intervention.

Again, there was considerable agreement between local and overseas representatives on the top order priority, reflecting once again the similarity of problems and potential solutions that clearly exist worldwide in this area.

## 6.4 CONCLUSION

This review of older driver issues has outlined a number of priority research and actions for future strategic initiatives aimed at improving older driver safety. Older driver safety will become of more concern over the coming years as the number of them on the road starts to increase quite dramatically. It is recommended that many of these be included in future research and management programs and highlighted in setting road safety agendas in future editions of state-wide strategic plans such as "*Safety First*".

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