



MONASH University



**Review of young driver risk taking and its association with
other risk taking behaviours**

RR 001

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Abstract

This report documents the investigation of the relationship between risky driving behaviours and other health risk behaviours among youth and young adults, locally and elsewhere. Literature reviews were undertaken of the development of risk taking; young driver behaviour; substance use including alcohol, smoking and illicit drugs; unsafe sex, and self-harm and suicide to identify and compare common risk factors for local youth and those elsewhere. Countermeasures that can be adopted from other risk taking areas and applied to young driver risk taking were also reviewed. A number of recommendations were provided for potential interventions to reduce risk taking on the road as well as others for additional research into the relationship between risk taking on the road and elsewhere for Western Australian youth.

Keywords

Young drivers; biopsychosocial development; risk taking; road crashes; alcohol; smoking; illicit drugs; unsafe sex; suicide and self-harm

Disclaimer

This report is disseminated in the interest of information exchange. The views expressed here are those of the authors and not necessarily those of Curtin University, Monash University or the University of Michigan.

TABLE OF CONTENTS

LIST OF TABLES	vii
LIST OF FIGURES.....	viii
EXECUTIVE SUMMARY	viii
ACKNOWLEDGEMENTS	xxiv
1. INTRODUCTION.....	1
1.1 Background.....	1
1.2 Aim and objectives	2
2. METHODOLOGY.....	4
2.1 Scope of the project	4
2.2 Retrieval of relevant literature for review.....	4
2.3 Organisation of the report.....	5
3. THEORETICAL PERSPECTIVES ON THE DEVELOPMENT OF YOUTH RISK TAKING.....	7
3.1 Introduction.....	7
3.2 Neurological development and risk taking	7
3.3 Cognitive development and risk taking	9
3.4 Emotional development and risk taking	10
3.5 Social development and risk taking	11
3.6 Problem Behaviour Theory and risk taking	13
3.7 Sensation Seeking personality and risk taking	16
3.8 Conclusion	18
4. YOUNG MOTOR VEHICLE DRIVERS.....	20
4.1 Crash involvement	20
4.2 Factors associated with the high rate of crash involvement	21
4.2.1 Inexperience and age	21
4.2.2 Gender	24
4.2.3 Risk taking and driver behaviour	25
4.2.4 The role of parents in the driving styles and outcome of young drivers	47
4.3 Interventions for young drivers.....	49
4.3.1 Driver education and training.....	49
4.3.2 Parental involvement in the training and management of learner and novice drivers.....	52
4.3.3 Graduated Driver Licensing	54
5. ALCOHOL.....	57
5.1 Prevalence of alcohol consumption and its association with demographic, sociocultural, and individual difference factors.....	58
5.2 Interventions for alcohol use.....	69
6. SMOKING	72
6.1 Prevalence of smoking and its association with demographic, sociocultural, and individual difference factors	72

6.2	Smoking and the risk of crashing	78
6.3	Interventions for smoking.....	78
7.	ILLICIT SUBSTANCE USE AND ABUSE	83
7.1	Prevalence of illicit drug use and abuse and its association with demographic, sociocultural and individual difference factors.....	83
7.2	Interventions to reduce the use of illicit drug use by youth.....	89
7.2.1	School-Based Programs	90
7.2.2	Mass Media	91
7.2.3	Sport and Recreation Programs.....	92
8.	SEX AND THE CONSEQUENCES OF UNSAFE SEXUAL BEHAVIOUR	93
8.1	Prevalence of sex and unsafe sexual behaviour and the association with demographic, sociocultural and individual difference factors.....	94
8.2	Interventions for Unsafe Sexual Practices	100
9.	SELF HARM AND SUICIDE-RELATED PHENOMENA	104
9.1	Incidence and prevalence of self-harm and suicide-related phenomena	105
9.2	Risk factors for self-injury, suicide, and other suicide-related phenomena.....	108
9.3	Intentional self-harm and young driver crashes.....	112
9.4	The role of alcohol and drugs in suicide.....	112
9.5	Self-harm and suicide interventions	114
9.5.1	Awareness and Education	115
9.5.2	Screening.....	116
9.5.3	Treatment interventions.....	116
9.5.4	Means restriction	116
9.5.5	Media.....	117
10.	DISCUSSION.....	118
10.1	Biopsychosocial development and risk taking behaviour	118
10.2	The relationship between risk taking behaviours	120
10.3	Comparative profile of risk taking by youth in Western Australia and elsewhere.....	122
10.3.1	Driving.....	123
10.3.2	Other risk taking behaviours.....	128
10.4	Effective and/or potential interventions for reducing youth risk taking behaviour.....	132
10.4.1	Young drivers	132
10.4.2	Alcohol use	134
10.4.3	Smoking.....	135
10.4.4	Illicit substance use and abuse.....	136
10.4.5	Sex and unsafe sexual practices.....	136
10.4.6	Intentional self-harm and suicide	136
10.5	Implications for interventions to improve young driver safety	137
10.5.1	Educational measures	137
10.5.2	Environmental control and social influence	139
10.5.3	The implementation of universal and co-ordinated strategies.....	141
10.6	Recommendations	142
10.6.1	Policy and practice.....	142
10.6.2	Future research	147

References.....	151
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LIST OF TABLES

Table 4.1	Incidence rate per 10,000 licensing days of 17 year old Western Australian novice drivers receiving one of more Traffic Infringement Notices for speeding; by year of driving and gender	36
Table 5.1	Percent of Western Australian young men and women by age group at risk of short and long term harm.....	62
Table 6.1	Percent of young Western Australian women and men by smoking status and age group; by age group, 2002-2005.	75
Table 7.1	Proportion of youth using illicit drugs; by drug type, school grade, sex; USA 2008	84
Table 7.2	Proportion of youth aged 14-19 years using illicit drugs; by drug type and sex, Australia 2002.....	85
Table 7.3	Proportion of males and females aged 16-24 years using illicit drugs; by drug type and age group, Western Australia, 2002-2005.	85
Table 8.1	Notification rates for Chlamydia and Gonorrhoea; for selected age groups, Western Australia, 2009.	94
Table 8.2	Self-reported sexual activity among Year 10 and Year 12 adolescents; by gender, Australia, 2008.....	96
Table 8.3	Use of contraception by type for 16-24 years old men and women; Western Australia, 2002-2005.	97
Table 9.1	Mean prevalence of and risk ratios for adolescent suicidal phenomena	105
Table 9.2	Suicide incidence rate [^] for selected ages in Australia, Canada and USA ..	106

LIST OF FIGURES

Figure 4.1	US driver fatality rates per 100,000 persons by age group (Insurance Institute for Highway Safety, 2007; FHWA, 2008)	20
Figure 4.2	Rate of police recorded crash involvement for Western Australian drivers first licensed at 17 years of age in 1998; by month of licensure up to 60 months post licensing (source: Palamara, 2005).....	23
Figure 10.1	Ecological model of adolescent development and injury risk.....	120

EXECUTIVE SUMMARY

Introduction

Young Australians aged 17-25 years have high rates of death and hospitalisation due to injury, particularly through their use of motor vehicles. Across the highly motorised Western World young drivers are over-represented in crashes. While it is clear that a lack of experience and skills and developmental immaturity contribute to the high crash risk of young drivers, other risk related behaviours such as speeding and drink and drug driving play a part. There is strong evidence to show that these risky on-road behaviours do not however, occur in isolation of other risky lifestyle practices by young people such as smoking and the use and abuse of alcohol and illicit substances. This could be because risk taking per se is part of the developmental process for youth and young adults.

Aim and Objectives of the study

The overall aim of the current project is to understand risky driving behaviours and their outcomes within the larger context of the practice of health risk behaviours among youth and young adults, 17-25 years locally and internationally. The objectives of the project are to:

- Review the local and international literature to describe the pattern of crash and injury and on-road risk taking behaviours for drivers aged 17-25 years;
- Review the local and international literature to describe the engagement of youth and young adults up to 25 years of age in a select range of non-road health-related risk behaviours;
- Review the literature to describe the developmental and psychosocial factors underlying the engagement of youth and young adults in risk taking behaviour on the road and elsewhere and the nature of the association between the two areas;
- Use the research findings to compare the profiles of risk taking among young Western Australians and those elsewhere;
- Review the literature to describe countermeasures from areas other than road safety that might be used to impact on young people's crash risk and aberrant driving behaviour;
- Make recommendations for the development and implementation of initiatives to address the interconnect between young driver behaviour and other examples of risk taking; and
- To make recommendations for research into driving and risk taking where knowledge is lacking for the population of Western Australian adolescents and young adults.

Method

The study consisted of a two stage literature review. The first stage sourced information pertaining to Western Australia by searching the relevant online literature databases such as MEDLINE, PSYCINFO, TRISonline, Google Scholar, and websites searched via Google. This material was supplemented by unpublished reports and data identified by the local contacts of the authors. Members of the Project Advisory Group (PAG) were asked to identify and supply all relevant ‘in house’ publications and information within their agency pertaining to youth.

The second stage sourced relevant national and international literature for the selected health risk areas through the development of a set of selection criteria specific to each topic. These selection criteria were then used to gather appropriate articles, reports, and other documents. Several databases were searched including, MEDLINE, PSYCINFO, TRISonline, ProQuest, ScienceDirect, Google Scholar, UM-MIRLYN, and UMTRI’s Library.

The following areas of young adult behaviour were covered in the review of the literature:

- Motor vehicle drivers;
- Use of alcohol;
- Smoking;
- Use of illicit drugs;
- Sex and unsafe sexual practices;
- Intentional self-harm and suicide.

For the purposes of this project the age band of young people was defined as 17-25 years. The review did not however, necessarily exclude relevant information from the wider age bracket of persons aged 12 to 30 years since many publications included this expanded range in the discussion of youth, emerging adults and young adults.

Due to the wide scope of topics encompassed in this review emphasis was placed, where possible, on the retrieval and use of systematic reviews and meta-analytic articles rather than original, primary research documents.

Summary of the main findings of the literature review

Theoretical perspective on the development of risk taking behaviour

There is good reason to believe that the rise in risk taking behaviours during adolescence is associated with, if not causally influenced by, various age-related biological, and cognitive, emotional and social development factors. To some extent risk taking behaviour is regarded as developmentally normative and often presents as a syndrome of associated problem behaviours that can result in adverse outcomes. The implications of the review of the various theoretical perspectives is that risk taking behaviours are best managed by a suite of initiatives that, for example, simultaneously focus on decision making processes, emotional regulation, the type and quality of relationships adolescents have with peers and adults, and the organisation of environmental contexts that limit or promote opportunities for the expression of risk taking behaviours.

Profile of young driver involvement in crashes and on-road risk taking behaviour

Crashes

Across all locations – Western Australia and elsewhere - there was consistent and good evidence of an increased risk of crash involvement for the following young drivers:

- Males, relative to females.
- Those in their earliest months of licensure (e.g. less than 12 months), relative to more experienced young drivers.
- Those with a history of drink driving offences, particularly those of legal drinking age and older; e.g., 18-25 years in Australia, older than 21 years in the USA because of the higher legal drinking age.
- Those who speed and particularly those who engage in high level speeding.

Relative to the above, there is less developed, less consistent evidence of an increased risk of crash involvement for the following young drivers in Western Australia and elsewhere:

- High sensation seeking individuals, relative to those categorised as moderate or low on the measure.
- Those who use mobile phones or text whilst driving.
- Those who drive without a valid licence or have at some stage driven without one.

Compared with Western Australia, for which there was little or no evidence, young drivers elsewhere were more likely to crash if:

- They drove drowsy or fatigued.
- Carrying same aged peer passengers.
- Their parents have poor driving records in terms of crashes and/or traffic offences.
- Their parents are relatively disengaged in terms of parental monitoring and control and are lenient in regards to restrictions around driving.
- They smoke, drank alcohol, and use substances such as marijuana at an early age (i.e., 15 years).

Unfortunately no useful contemporary published information could be found for the effect of the following WA young driver demographic, sociocultural, and driving factors on crash involvement:

- Nationality (including Indigenous status).
- Residential location.
- Socio-economic status.
- Educational attainment.
- Occupation.
- Family structure.
- Parent driving history.
- Histories of licensing, crash and offence behaviour.
- Driving exposure, including hours/days of driving and qualitative dimensions such as the carriage of passengers, type of trip, time of driving.

Drink driving

Though young drivers do not engage in drink driving to the extent of other older age groups, the prevalence is still relatively high and they are more likely to be involved in a serious crash when they do drink alcohol and drive. This is possibly due to their lack of driving experience coupled with their lower tolerance of the effects of alcohol.

The most recent WA evidence shows that young drivers are over-represented in fatal crashes involving a BAC greater than zero (based on the proportion of the licensed driver population they represent). No published information could be found on the incidence of alcohol related traffic offences for this age group. A direct comparison between Western Australia, Australia,

and elsewhere like the USA was difficult because of the older legal drinking age of 21 in the latter country. Thus drink driving was more an issue for the younger age novices in Australia and older age young drivers in the USA.

There is consistent and good evidence of an increased risk of drink driving for the following young drivers in Western Australia and elsewhere:

- Males compared with females.

Relative to the above, there is less developed evidence of an increased risk of drink driving for the following young drivers in Western Australia and elsewhere:

- Moderate to high sensation seeking individuals, relative to those categorised as moderate or low on the measure.
- Those who frequently consume alcohol.
- Those with a self-rated driving style that might be described as ‘anti-social’ (i.e., risky, intolerant, aggressive, impatient and hurried).
- A history of unlicensed driving.

In Western Australia, compared with elsewhere, there was some evidence of an increased risk of drink driving for the following young drivers:

- Those with a history of drink driving offences, particularly those of legal drinking age and older (i.e., 18-25 years).

In contrast, there was an increased risk of drink driving by young drivers elsewhere if they:

- Had lower school grades.
- Had a history of alcohol abuse.
- Used illicit substances such as marijuana.
- Reported unlicensed driving.
- Had parents and peers who used alcohol.

Speeding

Like alcohol, speeding is a significant risk factor for young drivers as evidenced by the ‘judged’ contribution of speed to their crashes and their higher incidence of self-reported speeding and police issued speeding offences.

There is consistent and good evidence in Western Australia and elsewhere of an increased risk of speeding for the following young drivers:

- Males, relative to females;
- Those with a history of speeding offences;
- Younger age, less experienced young drivers (e.g., 17-19 years).

Relative to the above, there is less developed evidence of an increased risk of speeding for the following young drivers in Western Australia and elsewhere:

- High sensation seeking individuals, relative to those categorised as low to moderate on the measure.

In Western Australia, compared with elsewhere, there was some evidence of an increased risk of speeding for the following young drivers:

- Those with a self-rated driving style that is described as ‘confident’ and ‘adventurous’.
- Those who engage in a relatively low level of positive health related behaviour, (based on self-reported drinking, smoking, failure to exercise, and to use sunscreen).

Compared with young drivers in Western Australia, young driver elsewhere were more likely to speed if they:

- Had a disposition toward ‘anti-social’ behaviour.
- Associated with ‘anti-social’ peers.
- Had a history of previous driving offences.
- Had a history of involvement with the criminal justice system.
- Had been unemployed.
- Engaged in multi-substance abuse (i.e., alcohol, marijuana).

Non-use of a seat belt

Compared with alcohol and speeding, the non-use of a seat-belt by young drivers appears to be a greater problem elsewhere than it is in Australia or Western Australia. Even so, there is some evidence to suggest that younger age drivers are more likely than much older age drivers (40+ years) to drive unbelted.

There is consistent and good evidence of an increased risk of non-use of a seat belt among Western Australian drivers and drivers elsewhere for the following:

- Males compared females.

In Western Australia, compared with elsewhere, there was some evidence of higher incidence of non-use of a seat belt for the following young drivers:

- Those who reside in rural areas compared with those residing in metropolitan Perth.
- Those of Aboriginal and Torres Strait Islander background compared with non-Indigenous persons.

Compared with young drivers in Western Australia, the following young drivers elsewhere were more likely to be unbelted:

- High sensation seeking individuals, relative to those categorised as moderate or low on the measure.
- Those who self-report unlicensed driving.
- Those who engage in a syndrome of problem behaviours consisting of alcohol use, marijuana use, and gambling.

Distracted and fatigue driving

Unlike the previous three risk taking behaviours, less information is available for young driver distraction and fatigue. In-car mobile phone use is a source of driver distraction and inattention and a documented risk for crash involvement among all drivers, not just young drivers. The little evidence that is available suggests that young drivers, including those in Western Australia, are more likely than older age drivers to perceive the use of a mobile phone while driving as safe; to use a mobile phone whilst driving, and to have been using a mobile phone prior to being involved in a crash. Driving whilst fatigued or drowsy is also thought to be a risk factor for crash involvement but due to the difficulty in objectively measuring these conditions they are most likely under-reported. Thus there is very limited information on these conditions as risk behaviours among young drivers, in Western Australia and elsewhere.

At best, there is weak/conditional evidence of an increased risk of mobile phone use and other distracting behaviours (i.e., changing CD) by young drivers compared to older drivers in Western Australia and elsewhere. Evidence was noted elsewhere that young females were somewhat more likely to engage in in-car distracting behaviours due to applying makeup and texting. In relation to fatigue, there is some conditional Western Australian evidence to suggest that young drivers/riders have double the risk of older age drivers/riders of being involved in a fatigue related serious injury crash (2% versus 1%), with males more so than females

evidencing a higher risk of being fatigued and crashing. Evidence from elsewhere suggests that fatigue may be more of an issue for drivers 20-29 years of age.

Unlicensed driving

Similarly, there was comparatively less evidence available on unlicensed driving among youth even though unlicensed driving is considered to be an emerging problem. Like the non-use of a seat belt the prevalence of unlicensed driving is thought to be reasonably low, but those who drive unlicensed have a much higher risk of involvement in a serious injury crash. There was no consistent or strong published information for young Western Australian drivers in relation to unlicensed driving. In contrast, more information on this risk behaviour was noted for young drivers elsewhere.

There is varying levels of evidence to suggest that the following young drivers in Western Australia and those elsewhere are likely to drive unlicensed:

- Males compared with females.
- Indigenous persons or those of ethnic minorities.
- Those residing in rural areas.

Compared with young drivers in Western Australia, the following young driver elsewhere were more likely to drive unlicensed:

- Those who are less likely to use a seat belt.
- Those who have lower school grades.
- Those who report drink driving.

Profile of the involvement of young people in non-road related risk taking behaviours

Alcohol use

In Western Australia like elsewhere, the onset of adolescence is associated with a marked increase in alcohol use. Around three quarters of Western Australia's young people aged 18-30 years reported regular use of alcohol. Although many reported drinking within acceptable levels from both health and social perspectives, around one-quarter were considered to be drinking at risky levels. Elsewhere, the proportion of young people who report using alcohol at least monthly ranged from 30% in four countries to over 70% in seven countries.

There is reasonably consistent and good evidence of an increased use of alcohol by the following young Western Australians and those elsewhere:

- Males compared with females.
- Older age young people (e.g., 20-24 years versus 17-19 years).
- Indigenous compared with non-Indigenous.
- Those with a network of peers that consume alcohol and where alcohol is part of the 'social fabric'.

Elsewhere there was good evidence to show that alcohol use was more common among the following young people:

- Those whose parents consume alcohol.
- High sensation seeking individuals relative to those categorised as moderate or low on the measure.
- Those attempting to cope with negative emotional states.

Smoking

The rate of smoking amongst young people in Western Australia varied with age, with one survey reporting that around one-fifth of those 16-19 years were smokers, with the proportion increasing to one-third of those aged 25-29 years and declining with increasing age. It has been difficult to arrive at an overview of young people's smoking prevalence across different countries, in part because there were wide variations in smoking prevalence country to country and because the estimates of prevalence were based on different methods and used different age and smoking parameters. However there is some evidence to suggest that smoking rates for Australian young people were relatively low comparatively.

In Western Australia and elsewhere there was good evidence to show that prevalence of smoking was similar among young males and females but significantly higher among the following young persons:

- Indigenous compared with non-Indigenous.
- Lower educational and socioeconomic backgrounds.
- High sensation seekers relative to low to moderate sensation seekers.

Elsewhere there was some evidence that the following youth were more likely to be smokers:

- Those whose parents smoke.
- Those with a range of psychological and emotional disorders.
- Those who consume alcohol and other substances.

Illicit substance use and abuse

Fewer Western Australian youth use illicit drugs compared with those who use alcohol and smoke. Survey data shows that marijuana use is highest among youth (ranging from 6.7% to 15.7%), followed by amphetamines (4.3% to 12%) and ecstasy (1.8% to 11.4%). In contrast, around one in three American youth report the use of some illicit drug with most using marijuana, as was the case for other Australian youth.

There is some evidence of a higher prevalence of illicit drug use among the following young people in Western Australia and elsewhere:

- Males compared with females.
- Indigenous compared with non-Indigenous (marijuana use specifically).
- Older age young people compared to younger (e.g., 20-24 years versus 16-19 years).

Elsewhere, the following young persons were more likely to use some form of illicit substance:

- Those whose parents and peers use illicit drugs.
- Those subject to a range of socioeconomic factors such as financial, educational, and environmental disadvantage.
- Those whose family circumstances include parental conflict, low parental monitoring; poor communication within families; low emotional attachment.
- Those with an aggressive behavioural style.
- High sensation seeking individuals, relative to those categorised as moderate or low on the measure.

Sex and unsafe sexual practices

Just under one-half of Western Australian youth had their first sexual encounter under the age of sixteen years, with over one-half of those aged 16-19 years having had sexual experience. The extent of 'safe sex' practices varied from study to study but evidence suggests that nearly one-half of all sexually active young women did not insist on condom use – with one-third of young men not using condoms. In Australia overall, it appears that both the prevalence of sexual activity and the number of different sexual partners are increasing – with a recent survey showing that around one-quarter of Year 10 and one-half of Year 12 students were sexually active. Although the levels of condom use were stable across recent years, condoms were not used in over one-quarter of the most recent sexual encounters. This situation is

similar to overseas findings where many young people report an active sexual life and where typically condom use is high but far from universal.

There is some evidence of a lower incidence of condom use and good evidence of a higher incidence of sexually transmissible disease among the following young people in Western Australia and elsewhere:

- Females compared with males;
- Indigenous compared with non-Indigenous though in Western Australia the evidence for a lower of condoms was less direct and related more to the higher prevalence of sexually transmissible diseases associated with unprotected sex.
- Older age young people compared to younger (e.g., 20-24 years versus 15-19 years) (sexually transmissible disease only).

Elsewhere there was good evidence of a decreased use of condoms and/or higher incidence of STD among for the following young people:

- Those who use alcohol.
- High sensation seeking individuals relative to those categorised as moderate or low on the measure.
- Earlier sexual abuse victimisation.
- Those whose peers engage in risky sexual behaviour.
- Those who lack a positive and clear communication style with parents around sexuality.

Intentional self-harm and suicide related phenomena

Suicide is the leading cause of death among young Western Australians (14.2 deaths per 100,000), with around 8% of young people having seriously considered taking their own life. Internationally, suicide rates were comparable across Australia, Canada and the USA, with rates in most cases being somewhat higher among those aged 20-24 years compared with 15-24 years.

There is good to reasonable evidence of a higher risk of suicide and/or self-harm among the following young people in Western Australia and elsewhere:

- Males compared with females (suicide) and females compared with males (self-harm and suicidal thoughts).
- Those with a history or mental illness.
- Indigenous compared with non-Indigenous (implied for younger ages in WA).

- Those residing in rural locations.

Elsewhere, suicide and/or self-harm was more prevalent among the following young people:

- Those with some form of personality, behavioural or conduct disorder and with poor emotional regulation.
- High sensation seeking individuals, relative to those categorised as moderate or low on the measure.

There is good evidence implicating the use of the following by those young Western Australians who have contemplated suicide:

- Alcohol; use and/or history of illicit substance use, and the abuse of legal pharmaceuticals.

Implications for interventions to improve young driver safety

The focus of the review of countermeasures was not necessarily to identify specific programs that can be lifted and applied to the young driver problem. Rather, the focus is on the discussion of general principles gleaned from the non-road area that can be adopted or reinforced in their application to the young driver problem.

Educational measures

The review of risk taking interventions has identified that education has been the foundation of initiatives to reduce young peoples' risk taking across a broad range of behaviours. These programs appear to have had limited effectiveness, particularly in the context of driving where numerous early education and training programs have consistently failed to produce demonstrable safety benefits. While education interventions proliferate across the different health and social areas where youth demonstrate risky behaviours, and while there are many recommendations relating to the most effective structures, content and processes for these programs, there is a general dearth of supportive empirical evidence. This is not to suggest that a case cannot be made for the role of education in the pursuit of young driver safety.

Given the likelihood that education and training programs will always be relied upon to some extent in road safety, work in other areas has resulted in recommendations relating to the most effective structures, content and processes for educational efforts. The most effective school based educational programs to address substance use and abuse are likely to be, among other things:

- Underpinned by a sound theoretical framework of risk and protective factors.
- Be developmentally appropriate; promote resilience and coping skills; delivered interactively.
- Be delivered in an adequate ‘dosage’.
- Involve a strategy for wide dissemination.
- Be comprehensively evaluated.

School based education programs should also link to and complement existing policies, practices, and programs for the behaviour(s) in question.

SDERA’s *Keys for Life* pre-learner program is a ‘high profile’, government funded example of a local educational approach. In a number of respects it satisfies the requirements for effective school based education. On ‘face validity’ there is good reason to continue the support and expansion of the *Keys for Life* program. There is however, a lack of appropriate research and evidence attesting to the value and effectiveness of the program. Given the profile of the program and the continued push to expand the program State-wide, it is imperative that the pre-driver program be subjected to a considered, extensive impact / outcome evaluation.

The locally administered *Aussie Optimism Program* is also relevant to the discussion of education and promotion initiatives that show promise to counter risk taking on the road and the young driver problem more generally. This upper primary and lower secondary school based mental health promotion program which focuses on the development of positive social and cognitive skills and relations between parents and children has been found to reduce the use of alcohol immediately post course and both alcohol and tobacco use at 12-month follow-up among Western Australian youth aged 10-13 years. On the strength of these findings there is good reason to consider an expansion of the program to facilitate a large scale evaluation of its impact on young driver outcomes such as crashes and relevant traffic offences.

The strongest conclusion to be drawn from the review of educational measures and their effectiveness is that educational initiatives that exclusively focus on developing behaviour-specific knowledge and attitudes are unlikely to be effective in isolation of initiatives that focus on the development of broader based personal life skills that equip young people to manage the stresses and pressures of everyday life that can predispose them to risk behaviours.

Environmental control and social influence

The inescapable conclusion from the many evaluations of interventions targeting young drivers is that the highest crash reductions will result from those interventions which directly act upon the environment in which young people drive. This conclusion is also consistent with the limited evidence available in other health and social areas that environmental controls are likely to have a positive impact on risk behaviour. The regulatory controls over the purchase and consumption of alcohol, tobacco products, illicit and prescription drugs, and gun ownership are relevant examples that attempt to limit the young person's access to means that might prove harmful to their health. This conclusion is also consistent with the Safe System approach to road safety currently being implemented in Western Australia in the form of *Towards Zero*. Safe System strategies commonly recognise that the individual road user is the weakest link in developing a safe transport system.

Well-developed graduated licensing schemes provide the strongest and most effective environmental controls for young drivers and risk taking in the early stages of licensure through the many components that restrict and limit novices and young drivers to environmental and social risk factors.

Graduated licensing programs are likely to be maximally effective if reinforced and supported by the broader sociocultural context within which the young driver exists. Part of that context is the influence that peers and parents can have over the behaviour of young people. These influences were particularly noted in relation to driving, the use and abuse of substances such as tobacco, alcohol, and illicit drugs. The influence of parents and peers on young driver behaviours suggests that the traditional Safe System approach is necessary but less than sufficient for dealing with the various sociocultural factors that can affect young driver behaviour. For this reason then, young driver countermeasures should also, for example, have a stronger focus on:

- Facilitating a positive role for parents in safe driving.
- Limiting the adverse effects of peers while harnessing the 'power and influence of peers' to work as effective role models and a source of social support.
- Initiatives to reduce and limit social disadvantage in dealing with the driver licensing system and in other related areas which predisposes youth to risk taking.

The implementation of universal and co-ordinated strategies

The conclusions drawn of the effectiveness of programs for suicide prevention highlight some useful strategies and processes that could be applied to the young driver problem. Strategies that are truly national in their focus and co-ordinate well with other supporting initiatives are likely to be most effective. It is reasonable to question whether a truly national approach to the young driver problem might have a greater impact rather than one that is fragmented by state boundaries and political agendas, and secondly, whether it is now possible to develop a national program. An agreed national approach to graduated licensing in respect to both the elements of and timing of the elements would present a clearer, consistent understanding for the community of young driver risks and their countermeasures and thus engender greater acceptance and support for local programs.

A national strategy to the young driver problem might also ensure that jurisdictions are bound and committed to an evaluation of their front-line strategies, such as graduated licensing programs, to ensure their suitability and need for refinement both in terms of process and content.

The issue of co-ordination between strategies that are ‘complementary’ is also relevant to the young driver problem. How policies and strategies in other areas, such as alcohol and drug use, impact on driver behaviour and how modifications in these areas can explicitly and specifically impact on driver behaviour should be considered.

Recommendations

Policy and practice

- (i) Strengthen the existing Western Australian Graduated Driver Training and Licensing program through the implementation of initiatives, such as:
 - Increase the required number of *Phase Two* hours of supervised driving for learner drivers.
 - Re-consider the introduction of peer passenger restrictions for Provisional drivers.
 - Restrict Provisional drivers from using mobile telephones - hands-free and hand-held – whilst driving.
 - Extend the zero Blood Alcohol Concentration requirements to three years through an extension of the Provisional licensing period.
 - Introduce increased demerit point penalties for speeding for Provisional drivers.

- Introduce an offence/demerit free period as a pre-requisite for graduation through the various phases in the Provisional period and from a Provisional licence to full licence.
- (ii) Initiation of community and expert consultation to consider an increase in the minimum Provisional licensing age and other methods to effectively delay driver licensure.
- (iii) Support resilience based education and training programs for pre-learner and novice drivers.
- (iv) Support initiatives that engage the parents and peers of learner and novice drivers to support safe young driver behaviours.
- (v) Development of gender specific mass media campaigns to address problem driving by young males.
- (vi) Promotion of a 'harmonised' national '*best practice*' graduated driver training and licensing program.

Future Research

- (i) Undertake a time-series evaluation of the Western Australian graduated driver training and licensing program.
- (ii) Investigate the relationship between the driving outcomes of supervising parents and supervised novice drivers.
- (iii) Undertake an impact and outcome evaluation of the SDERA *Keys for Life* program.
- (iv) Undertake an evaluation of the impact of the *Aussie Optimism Program* on driving outcomes.
- (v) Investigate the deterrent effect of penalties on young driver behaviour and associated consequences.
- (vi) Investigate how and what young drivers learn when involved in a crash that can reduce their risk of subsequent crashes.
- (vii) Develop a program of research to evaluate the impact on young drivers of existing and emerging Safe Systems strategies.
- (viii) The development of a linked database investigation of the relationship between driving and other problem behaviours among Western Australian youth and young adults.

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1. INTRODUCTION

1.1 Background

Injury among young Australians aged 12-24 years is a major public health concern due to its disproportionate contribution to the death and morbidity for this age group. In 2007, injury accounted for approximately two-thirds of deaths in this age group (Australian Institute of Health and Welfare [AIHW], 2011) and was the third leading cause of hospitalisation in 2005-2006 (AIHW, 2008). Consistent with this, injury accounted for two-thirds of the Years of Life Lost and was the second leading cause of Disability-Adjusted Life Years for persons aged 15-24 years in 2003 (AIHW, 2008).

Among the young Australians that are injured, motor vehicle drivers are noted for their over-representation and substantial contribution to the death and hospitalisation of this age group. Persons aged 17-25 comprise 15.4% of the Australian population (Australian Bureau of Statistics [ABS], 2010) and yet they accounted for 26.2% of all driver deaths in 2010 (Bureau of Infrastructure, Transport and Regional Economics (BITRE), 2011). Furthermore, in 2009 they were nearly twice as likely as all age drivers to be killed: 6.3 deaths per 100,000 population *versus* 3.3 for all age drivers (BITRE, 2010).

Young drivers have a greater risk of crash involvement and injury for a number of reasons. Foremost among these is their lack of experience and associated skills deficits (Organization for Economic Co-Operation and Development, [OECD], 2006). In addition to this, their developmental immaturity and youthfulness can lead to greater intentional and unintentional on-road risk taking behaviours - such as speeding, close following, drink-driving, and failure to wear a seat belt - that can further increase their risk of crash involvement and/or injury (ABS, 2009b; Smart & Vassallo, 2005; Tronsmoen, 2010).

There is strong evidence to show that these risky on-road behaviours do not however, occur in isolation of other risky lifestyle practices by young people such as smoking and the use and abuse of alcohol and illicit substances (ABS, 2009b; Bingham & Shope, 2004; Smart & Vassallo, 2005). This is perhaps because the behaviours share common antecedent risk and protective factors. The co-occurrence of risk behaviours that have the potential to compromise health and well-being is not an altogether

surprising finding. The developmental stage of adolescence and young adulthood is characterized by immense biological (Dahl, 2008) and psychosocial change (Steinberg & Morris, 2001) and can result in young people experimenting with a range of behaviours, including those that may result in adverse health outcomes, in the course of transitioning to adult identities and responsibilities (Dahl, 2008; Schmied & Tully, 2009).

To date, no reviews of the literature have been undertaken to synthesise the extensive research on risky driving and the relationship with other health risk behaviours among adolescents and young adults in Western Australia. If common antecedent risk and protective factors can be identified for this age group it may be possible to develop countermeasures for risky driving which borrow from or are based on successful interventions in the non-road related risk area or that simultaneously target multiple risk behaviours.

1.2 **Aim and objectives**

The overall aim of the current project is to understand risky driving behaviours and their outcomes within the larger context of the practice of health risk behaviours among youth and young adults, 17-25 years locally and internationally. The objectives of the project are to:

- Review the local and international literature to describe the pattern of crash and injury and on-road risk taking behaviours for drivers aged 17-25 years;
- Review the local and international literature to describe the engagement of youth and young adults up to 25 years of age in a select range of non-road health-related risk behaviours;
- Review the literature to describe the developmental and psychosocial factors underlying the engagement of youth and young adults in risk taking behaviour on the road and elsewhere and the nature of the association between the two areas;
- Use the research findings to compare the profiles of risk taking among young Western Australians and those elsewhere;
- Review the literature to describe countermeasures from areas other than road safety that might be used to impact on young people's crash risk and aberrant driving behaviour;

- Make recommendations for the development and implementation of initiatives to address the interconnect between young driver behaviour and other examples of risk taking; and
- To make recommendations for research into driving and risk taking where knowledge is lacking for the population of Western Australian adolescents and young adults.

2. METHODOLOGY

2.1 Scope of the project

The aims and objectives of this project were addressed through the retrieval and review of published and unpublished material pertaining to the following areas of young adult behaviour:

- Motor vehicle drivers
- Use of alcohol;
- Smoking;
- Use of illicit drugs;
- Sex and unsafe sexual practices;
- Intentional self-harm and suicide;

While these areas do not reflect all areas of potential health risk behaviour for young people (others include diet, exercise and obesity) they nevertheless collectively have a substantial impact on the physical and psychosocial well-being of young people (AIHW, 2007).

For the purposes of this project the age band of young people was defined as 17-25 years. This encompasses the minimum motor vehicle driver licensing age in Western Australia and the maximum age typically considered in the discussion of ‘young drivers’ (though Western Australia restricts their discussion of young drivers to the upper age of 24 years). The review did not however, necessarily exclude relevant information from the wider age bracket of persons aged 12 to 30 years since many publications included this expanded range in the discussion of youth, emerging adults and young adults.

2.2 Retrieval of relevant literature for review

The study aims were addressed through a comparative review of the risk behaviour profiles of adolescents and young adults in Western Australia with those elsewhere in Australia and internationally. The review of relevant literature was therefore conducted in two stages.

In stage one (undertaken by staff of the Curtin-Monash Accident Research Centre) information pertaining to Western Australia for the above health risk areas was sourced by searching the relevant online literature databases such as MEDLINE,

PSYCINFO, TRISonline, Google Scholar, and websites searched via Google. This material was supplemented by unpublished reports and data identified by the local contacts of the authors. Secondly, members of the Project Advisory Group (PAG) were asked to identify and supply all relevant 'in house' publications and information within their agency pertaining to youth. The PAG consisted of representatives of local government and non-government organisations from the sectors of youth welfare, health, education, policing, road safety, justice and corrections, and data surveillance and management.

In stage two (undertaken by staff of the University of Michigan Transportation Research Institute-UMTRI) relevant national and international literature for the selected health risk areas was sourced. The literature search was conducted by first developing a set of selection criteria that were specific to each topic that was reviewed. These selection criteria were derived from UMTRI's knowledge of the teen literature and previous reviews of the literature conducted by members of the UMTRI team (Eby & Molnar, 1998; Eby et al. in press). The selection criteria were used to gather appropriate articles, reports, and other documents. Several databases were searched including, MEDLINE, PSYCINFO, TRISonline, ProQuest, ScienceDirect, Google Scholar, UM-MIRLYN, and UMTRI's Library.

It is important to note that because of the wide scope of topics encompassed in this review emphasis was placed, where possible, on the *retrieval and use of systematic reviews and meta-analytic articles rather than original, primary research documents*.

2.3 **Organisation of the report**

A summary of key youth development and biopsychosocial factors is provided in Chapter 3 to provide a theoretical context for the occurrence of risk taking on the road and elsewhere. Chapters 4 through 9 summarise and quantify where possible the involvement of youth – locally and elsewhere- in the areas listed in Section 2.1 and the interrelationship of these areas of behaviour. Following this, the reviewed material is drawn together in Chapter 10 to present a discussion of the theory of the development of risk taking in relation to driving; the relationship between risk taking behaviours; a comparative profile of the risk taking of Western Australian youth compared with youth elsewhere; a summary of the effective or potential

countermeasure to reduce risk taking, and the implications of the reviewed material to improve young driver safety. The chapter concludes with the presentation of a number of recommendations for policy and practice and further research.

3. THEORETICAL PERSPECTIVES ON THE DEVELOPMENT OF YOUTH RISK TAKING

3.1 Introduction

Explanations for the development of risk taking behaviours range from strict determinist biological models, cognitive and emotional developmental models, through to environmentally-based social development and social learning theory explanations. Common to the various perspectives is an explanation of why risk taking behaviour reliably increases from childhood to adolescence and early adulthood and then gradually declines with increasing age (Steinberg, 2008). Individually these perspectives provide a limited understanding of the aetiology of risk taking which more realistically is the result of an interaction of factors in each of these areas (Boyer, 2006). At this stage no single empirically validated theory combining elements of all perspectives has been developed.

In the following sections a summary overview of the biopsychosocial factors associated with the development of risk taking behaviour among youth will be presented. This material relies heavily on the comprehensive reviews by Boyer (2006) and Steinberg (2008) of the development of risk taking. Following this, Problem Behaviour Theory (PBT) (Jessor, 1991) and the personality factor of Sensation Seeking (SS) (Zuckerman, 1994) are described. Problem Behaviour Theory and Sensation Seeking are included because they are the two most commonly researched theories of risk taking in relation to young driver behaviour and other health risk behaviours.

3.2 Neurological development and risk taking

Researchers have identified and isolated a number of neurological structural changes during adolescence related to the regulation of behaviour and emotion. Because these structural changes occur during adolescence, a time of increased risk taking, researchers have postulated a direct link between these structural changes and risk taking behaviour (Boyer, 2006; Steinberg, 2008). Steinberg (2008) considers that two processes, underpinned by neurological and biochemical changes, potentially explain why risk taking *increases* between childhood and adolescence and *declines* from late adolescence/early adulthood onwards.

Increased risk taking during adolescence is thought to be associated with changes during puberty in the pattern of dopaminergic activity which influence the salience of rewarding behaviours and the sensitivity to these rewards. These changes are assumed to influence the propensity for sensation seeking. Accompanying this change is an increase in oxytocin receptors which have been linked to heightened attentiveness to and memory for social information. Steinberg (2008) has described this as the *socio-emotional system*. He considers the system explains why adolescents post-puberty take more risks and are more inclined to do so in the presence of peers.

The decline in risk taking post-adolescence/early adulthood is thought to involve an opposing regulatory system described by Steinberg (2008) as the *cognitive-control system*. It is thought that an individual's ability to undertake longer-term planning and to regulate impulsive behaviour is due to maturational changes involving the prefrontal cortex that occur post adolescence/early adulthood. Also contributing to the change in risk taking behaviour is an improved modulation of socially and emotionally aroused inclination through deliberative reasoning brought about by a maturation of connections across cortical areas and between sub-cortical systems (Steinberg, 2008).

In summary, Steinberg (2008) proposes that risk taking behaviour is the result of an interaction between two systems: the former which is abruptly assertive during puberty/adolescence and the latter that slowly matures and peaks around the mid 20's and exerts greater control over the socio-emotional system. Steinberg (2008) thus considers that risk taking in adolescence is biologically motivated, 'normative', and to "...some extent inevitable" (p. 100). He also acknowledges that there is likely to be differences between adolescents of the same age in regards to the socio-emotional and cognitive-control system activities, which thus explains individual differences in risk taking activity among same aged peers.

This determinist and inevitable view of adolescent risk taking suggests there may be little that can be done by way of education to alter attitudes and perceptions to reduce risk taking. Steinberg (2008) alternatively suggests that a "...more profitable strategy might focus on limiting opportunities for immature judgement to have harmful consequences". This approach is entirely consistent with the philosophy of contemporary graduated licensing systems which aim to reduce or minimise the

exposure of young novice drivers to high crash risk scenarios while they gather experience and develop driving skills.

3.3 **Cognitive development and risk taking**

Developmental psychology has documented the change in cognitive capabilities that occur during adolescence. Unlike the concrete and empirical cognitive style that characterises childhood, adolescent thinking becomes more formal and abstract and demonstrates an increasing capacity for logical argument and reason (Berger, 1994). In comparison with adults, adolescents have nevertheless been viewed as cognitively less proficient and less able to process and make sense of information relevant to risk. This is presumed to account for their increased risk taking behaviour (Boyer, 2006).

In relation to the cognitive perspective on risk taking, research has found that people are inconsistent in their decision making. Studies have demonstrated a cognitive basis of sorts in relation to the development of risk taking: older boys tend to be less risk-averse, and there is variability in risk taking by five or six year olds. Younger children also have greater preference for risk over certain alternatives, independent of how the risks are stated, than do older children and adults. At the very least this suggests a developmental difference in risk interpretation. Adolescents, like adults, tend to prefer riskier options when choices are presented with loss frames (i.e., what is likely to be lost as a result of their behaviour), and prefer less risky options when choices are presented with gain frames (i.e., what is likely to be gained as a result of their behaviour).

From a purely cognitive standpoint, risk taking may be the product of a contextual-development interaction. Younger and older children perceive risk slightly different; children tend to prefer risk to certainty but by adolescence there is a tendency to alter preference as a function of the frame with which risks are presented. In addition, adolescents do not incorporate decision outcome feedback into their decisions to the extent that adults do.

Studies of adolescent risk taking encompass a wide range of conclusions about the ability of adolescents to evaluate risk. At best, the most valid conclusion is that there may be cognitive development during the adolescent years which may contribute to

adolescent decision-making skills and risk taking behaviour. In some regards, adolescents are quite similar to adults and adolescent risk taking cannot simply be attributed to an inability to estimate the probability of consequences or an attitude of excessive invulnerability (Boyer, 2006).

In conclusion, a number of studies have identified cognitive developments that imply decreased risk taking between adolescence and adulthood, while others have found a relative equivalence in cognitive ability and decision making between the age groups (Boyer, 2006). As such it is still unclear how cognition and development relate to the development of risk taking as the theoretical findings do not explain the real-world risk taking prevalence data.

3.4 **Emotional development and risk taking**

Research has also considered the role of emotion in risk taking behaviours and associated decision-making processes, with the main approach being the somatic marker hypothesis (SMH) (Boyer, 2006). This hypothesis posits that emotional responses to positive and negative consequences guide decision-making in risky and uncertain situations. According to this theory, emotions are necessary for decision-making and the inability to generate, attend to, and recall emotional responses in potentially risky situations is marked by an inability to make rational decisions. Research with emotionally impaired but otherwise cognitively normal individuals on risk taking tasks shows that emotional affect plays at least some role in risk taking. Gambling tasks used with children, adolescents, and young adults show that development of affective decision-making begins as early as three to four years of age and proceeds throughout childhood and adolescents, becoming more explicit with age.

The other approach to the role of emotional development in decision-making proposes that risk taking behaviours are the product of impulsivity (Boyer, 2006). The approach theorises that individuals who lack regulation skills hastily engage in more goal-defeating risky-behaviours, especially in frustrating or anger provoking decisions. Associations have been demonstrated between impulsivity and risk taking tendencies for children, adolescents, and adults. Children are less able to self-regulate than adults, and there are significant longitudinal relationships between early self-regulatory tendencies and later cognitive and social competencies.

Theoretically, individuals may engage in risky behaviours because they fail to regulate their emotions and as a consequence bypass critical decision-making processes such as attending to incoming information. These regulatory capacities continue to develop throughout adolescence. Emotional individuals have a tendency to bypass rational decision-making processes and irrationally engage in potentially dangerous risk taking behaviours. Emotional reactivity is assumed to bear upon the likelihood of cognitive evaluation of the decision-making situation, emphasising the interactive effects of cognition and affect for risk taking tendencies.

Boyer (2006) notes that adults have been found to be more psychosocially mature and tend to make more socially responsible decisions than adolescents, even if their cognitive process are mature. However, this may be circular reasoning: do adolescents take risks because they are psychosocially immature or are they considered psychosocially immature because they take risks? Affective motives, such as desire for positive affect, the avoidance of negative affect, and emotional coping strategies have been demonstrated to underlie risk taking behaviours. How these factors develop is yet to be understood.

As with the cognitive developmental approach, if affective decision-making and emotional regulation is associated with decreases in risk taking, and each increases with age, then as a person develops there should be a corresponding decrease in risk taking behaviour. However, this trend is not consistently seen across the broad range of risk taking prevalence data. Again, this suggests that the factors underlying risky behaviours are not one-dimensional but a product of the interaction between cognitive, affective, biological, and social factors (see below), and furthermore, that there is an age-based variability in the subjective values persons associate with the outcome of certain behaviours. Research does suggest however, that risk taking is higher in adolescence than later developmental periods because adolescents concentrate on the emotional consequences of risks less effectively than older populations and because they are more likely to impulsively neglect important decision information (Boyer, 2006).

3.5 Social development and risk taking

The social developmental perspective of risk taking proposes that a child's development occurs within a social and cultural context and that this context can

influence a child's behaviour including risk taking. One theory of social development and risk taking is the theory of broad and narrow socialisation (BNS) (Boyer, 2006). This posits that adolescents' disposition to engage in reckless behaviours are bound by the socio-cultural context in which they develop. A broad socio-cultural context is characterised by greater emphasis on adolescent autonomy, less clearly articulated rules of behaviours, and greater leniency for rule violations. Narrow socialisation is characterised by insistence on group allegiance and clear standards of conduct, violations of which invoke clear and forceful punishments. Socialisation is culturally and historically variable and is therefore an effective way to describe cultural, historical, and individual differences. The model is a reasonable attempt at a cross-perspective integration of risk taking findings, with strong socio-cultural underpinnings, although it relies heavily on cognitive egocentricity and disregards the role of emotional development.

The parent-child relationship has been extensively studied in relation to adolescent risk taking tendencies. Many theories are based around attachment theory. The general finding from a number of studies is that children with secure parental attachments engage in less risky behaviour than those with insecure attachments. Parenting styles are also implicated as predictors of risk taking in adolescence. Authoritative and authoritarian parenting tends to lead to decreases in risk taking while indulgent and neglectful parenting tends toward increases in risk taking. In general, it appears that parenting practises, parental warmth and openness of relationship, monitoring and knowledge of behaviours specifically affect adolescent engagement in risky behaviours (Boyer, 2006).

As children develop into adolescents there is a trade-off in time spent with adults and parents as more time is spent with peers. It is well acknowledged that peers may pressure one another into risk taking behaviour and many studies demonstrate that adolescents who associate with peers who engage in risk taking are more likely to likewise engage in risk taking themselves. However, the relationship between risk taking peers and personal risk taking is correlational and not necessarily causal of peer influence. It can also be argued that adolescents select the peers they associate with as a function of personal similarities and so children inclined toward risk taking tend to identify and associate with peers who are similarly inclined.

The influence of parents and peers on youth risk taking may not necessarily be discrete, with some evidence suggesting that these influences may interact. For example, Boyer (2006) reports evidence to suggest that positive peer relationships may limit the effects of negative parenting for risk taking, while relationships with antisocial peers can serve to intensify the effects of negative parenting. Boyer (2006) also reported that parental monitoring and disciplinary strategies at ten years of age were related to a child's association with antisocial peers at twelve years of age, which in turn were predictive of engagement in a wide range of antisocial behaviours. The conclusion drawn by Boyer (2006) of this research is that parenting tendencies appear to predict peer interactions, which are in turn predictive of adolescent risk taking.

The social developmental perspective on risk taking places great emphasis on the socio-cultural context including parenting styles and peer relations. At this point in time the evidence suggests that children whose parents are involved and engaged in their life and with whom they share an attached, secure relationship are less likely to engage in risk taking, especially if they also do not have close relationship with peers who do engage in risk taking.

3.6 **Problem Behaviour Theory and risk taking**

Problem Behaviour Theory (Jessor & Jessor, 1977; Jessor, 1987; Jessor, 1991; Boyer, 2006) provides a theoretical framework to explain the high occurrence of problem or risk behaviours and the interrelationship of behaviour among adolescents and young adults. Essentially, PBT proposes that problem behaviours (e.g., substance use and abuse; risky sexual activity and driving; school truancy and delinquency) are the result of an interplay among the individual's social circumstances and factors related to personality, environment, and behaviour. From that perspective PBT draws on many of the social developmental processes and issues presented above. The structure of PBT has been described as follows:

Social structural variables

Social structural variables include basic socioeconomic and socio-demographic issues such as parents' education and occupation; family structure, and religiosity. These variables are considered to be antecedents in the development of the

individual's personality and perceived environment systems which in turn influence behaviour (Boyer, 2006).

Personality system of the individual

Examples of this system's factors include the individual's motivations, values, expectations, beliefs, cognitive and emotional style, and self-regulation and control. These are thought to be influenced by the antecedent social structural variables and represent potential risk and protective factors for the development of problem behaviours (Boyer, 2006).

The perceived environmental system of the individual

This system relates to the individual's perception of their relationship with parents and peers, including such issues such as perceived parental control and support and influence of peers. This system is also influenced by social-structural variables and represents a second source of risk and protective factors (Boyer, 2006).

The individual's behavioural system

The behavioural system of the individual consists of both problem (non-normative for the individual's age and culture) and conventional (normative and developmentally appropriate). Problem behaviours encompass issues such as alcohol and illicit substance use or abuse; risky sex; risky driving; delinquency. Conversely, conventional behaviours relate to issues such as academic performance, school attendance, community engagement and participation. These behaviours are both influenced by and can impact on factors in the individual's personality and perceived environment system (Jessor, 1987).

Problem Behaviour Theory posits that the interplay between the above structures and systems creates a 'proneness' for adolescents to engage in problem or conventional behaviours as they transition from childhood dependence to independence (Boyer, 2006). Jessor (1991) also argues that problem behaviours may be interconnected such that involvement in one problem behaviour might increase the likelihood of engaging in other problem behaviour, thus leading to the establishment of a problem behaviour syndrome.

Overall, the value of PBT is that it provides a general framework for the examination and identification of risk and protective factors for the young driver problem and

opportunities for the development of relevant countermeasures. A limited number of studies have employed the PBT framework to explain young driver behaviours, with most providing varying support for the relationship between risk and protective factors within each of the three PBT systems and certain young driver behaviours, including:

- Police recorded alcohol related crashes and offences and non-alcohol related offences (Shope et al., 2003);
- Self-reported drink-driving (Bingham & Shope, 2004; Wilson & Jonah, 1987), and drug driving (Bingham & Shope, 2004), and
- Self-reported crash involvement (Smart & Vassallo 2005; Wilson & Jonah, 1987), risk driving (Bingham & Shope 2004; Smart & Vassallo, 2005) and speeding (Smart & Vassallo 2005).

From the perspective of PBT, risky driving among the young is thought to be part of a ‘problem behaviour syndrome’ (Wilson & Jonah, 1987). There has been considerable debate however, over the existence of a sub-group of young drivers whose driving style reflects or is part of a syndrome of problematic behaviours and the extent to which this group overly accounts for the crash involvement of young drivers.

An earlier review by Crettenden & Drummond (1994) of the literature on the differentiation between the *young driver problem* and the *young problem driver* found insufficient evidence to determine which perspective was the more credible or accurate. Following this, their own analysis of a Victorian mass crash database of single and multiple crash involved drivers led them to conclude that a young problem driver sub-group did exist and that this group – whilst accounting for a very small percentage of young driver crashes - had a higher than average level of crash risk because of their involvement in multiple crashes. Crittenden & Drummond (1994) nevertheless concluded that:

- An appropriate definition of and means to identify or ‘profile’ the problem young driver was still required;
- Traditional driver improvement programs would be limited in their ability to target this group; and that,

- Other ‘tailored’ programs would unlikely be cost-effective due to the relatively small number of problem young drivers they targeted.

Though Crettenden & Drummond’s (1994) findings might seem historical rather than contemporary, the authors of more recent research have concluded that inexperience and poor skill development as opposed to risk taking per se accounts for the majority of young driver crashes in the early period of licensure, and secondly, that increased experience would account for the majority of the reduction in young driver crashes over time (Forsyth, Maycock & Sexton, 1995; Kloeden, 2008).

This situation does not suggest that risk taking associated with the young problem driver is an irrelevant issue for research or countermeasure development. Rather, as Crettenden & Drummond (1994) concluded, interventions specifically targeting the young problem driver should be lower in priority but complimentary to programs which focus on the development and safety of the population of young drivers per se (such as contemporary graduated driver training and licensing programs which focus on the development of experience while limiting the novice’s exposure to known crash risk factors).

Information will be presented in the following chapters to highlight the relationship between variables and factors relevant to the structure of PBT and risk taking behaviours on the road and elsewhere.

3.7 **Sensation Seeking personality and risk taking**

Numerous studies have identified a range of personality correlates of risky taking behaviour. Foremost among these correlates, particularly in relation to young drivers, is the construct of sensation seeking which was developed by Zuckerman (1979) and elaborated by Arnett (1994). The construct characterises the disposition for the seeking of “...varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal and financial risks for the sake of such experiences” (Zuckerman, 1994, p. 27). Individuals who are high sensation seekers have a strong need to maintain a heightened level of physiological arousal and consequently seek new, novel and rewarding situations and experiences to maintain this level, irrespective of the risks inherent in the situation or experience (Zuckerman, 1994).

Zuckerman's (1994) version of sensation seeking is not a unitary trait but was considered to have a four-factor structure as measured by the original Sensation Seeking Scale. The four factors as described by Hittner & Swickert (2006) are:

Thrill, adventure, and experience seeking

This factor relates to the individual's need or desire to engage in physical activities that involve speed and/or danger (e.g., drive fast, undertake risky sports activities).

Experience seeking

This factor relates to the motivation to seek novel, new, or different experiences at the personal level such as travelling to new countries to experience new and different cultures.

Disinhibition

Individuals with high levels of disinhibition are less likely to be constrained by social norms and expectations of normative behaviour and are thus more likely to engage in experimental behaviours such as frequent and diverse sexual activity and illicit drug taking.

Boredom susceptibility

This factor describes the disposition of individuals to readily dismiss activities or situations that are routine or predictable and as a consequence seek out new experiences and persons to share these with.

The Sensation Seeking Scale (SSS) developed by Zuckerman and his colleagues (e.g., Zuckerman, Kolin, Price, & Zoob, 1964; Zuckerman & Link, 1968; Zuckerman, 1971; Zuckerman, Eysenck, & Eysenck, 1978) has been extensively used to research the demographics of sensation seeking and its relationship to high-risk behaviours. There is good evidence to suggest that sensation seeking has a strong biological component (Zuckerman, 1994) because of the pattern of scores across the lifespan and the differences in sensation seeking between males and females. It has been noted that Sensation Seeking Scale scores tend to increase with age up to around 16-19 years and then decline gradually through the life span, with scores varying consistently over the lifespan as a function of age and sex (e.g., Ball, Farnill, & Wangeman, 1984; Farley & Cox, 1971; Giambra, Camp, & Grodsky, 1992; Magaro, Smith, Cionini, & Velicogna, 1979; Russo, et al., 1993; Zuckerman,

Eysenck, & Eysenck, 1978; Zuckerman & Neeb, 1980). Several studies using this measure have shown that males score higher on the total SSS than females (e.g., Björk-Åkesson, 1990; Perez, Ortet, Pla, & Simo, 1986; Russo, et al. 1991; 1993; Teraski, Shiomi, Kishimoto, & Hiraoka, 1987; Zuckerman & Neeb, 1980).

A recent variant on the construct of Sensation Seeking includes the dimension of impulsivity. This relates to the behavioural style of entering situations and responding to cues of reward with little regard for the potential of punishment or loss and an inability to suppress potential reward-seeking behaviours that are inherently dangerous (Zuckerman & Kuhlman, 2000). Using the short-form measure of Impulsivity and Sensation Seeking Scale (Zuckerman, 1994), an Australian study of n=19,763 17 year old drivers in New South Wales found that a significantly greater proportion of males (42.6%) than females (29.7%) were ranked as high (versus moderate and low) sensation seekers (H. Y. Chen, personal communication, 2011).

Zuckerman (1994) has reported strong and consistent evidence to show that high sensation seeking individuals tend to focus on the benefits or rewards associated with risky behaviours while being largely undeterred by threats of punishment for inappropriate behaviour (Zuckerman, 1994). This finding, along with the disposition of high sensation seekers to experience thrill and new experiences and to be less concerned for expectations of normative and appropriate behaviour, suggest a strong theoretical link with risky driving behaviours and other health risk behaviours. Indeed authors such as Zuckerman (1994), Jonah (1997), Zuckerman & Kuhlman (2000) and Hittner & Swickett (2006) are among a multitude of authors that have demonstrated a relationship between high scores on sensation seeking and risky driving behaviours and/or other health risk behaviours such as drinking; smoking; illicit drug use, and risky and frequent sexual activity. Information on the relationship between sensation seeking and driving behaviours and other health risk behaviours will be further described in the following chapters.

3.8 **Conclusion**

This brief review has identified a number of theoretical perspectives on the development of risk taking behaviour in adolescence and young adulthood. There is good reason to believe that the rise in risk taking behaviours during adolescence is associated with, if not causally influenced by, various age-related biological,

cognitive, emotional and social development factors. Furthermore, it is reasonable to assume that the various factors interact in their association with risk taking. These conclusions portray risk taking behaviour as developmentally normative, albeit resulting in adverse outcomes at times. The findings of this review also suggest that risk taking behaviours are best managed by a suite of initiatives that, for example, simultaneously focus on decision making processes, emotional regulation, the type and quality of relationships adolescents have with peers and adults, and the organisation of environmental contexts that limit or promote opportunities for the expression of risking behaviours.

4. YOUNG MOTOR VEHICLE DRIVERS

4.1 Crash involvement

Traffic crashes are the leading cause of death for people aged 15-24 years in many developed countries around the world, including the 30 countries that make up the Organisation for Economic Co-operation and Development (OECD, 2006). According to the International Road Traffic and Accident Database (2009) more than 17,500 young people died in traffic crashes in the OECD member countries in 2008, including 364 in Australia, 713 in Canada, 659 in Great Britain, 655 in Japan, and 8,723 in the US. Young drivers account for between 18%-30% of all driver fatalities in OECD countries, but only represent between 9%-13% of drivers in these countries (OECD, 2006). Even after adjusting for driving exposure, young drivers in the US still have the highest fatality rate of all drivers except for the very oldest age group (see Figure 4.1)

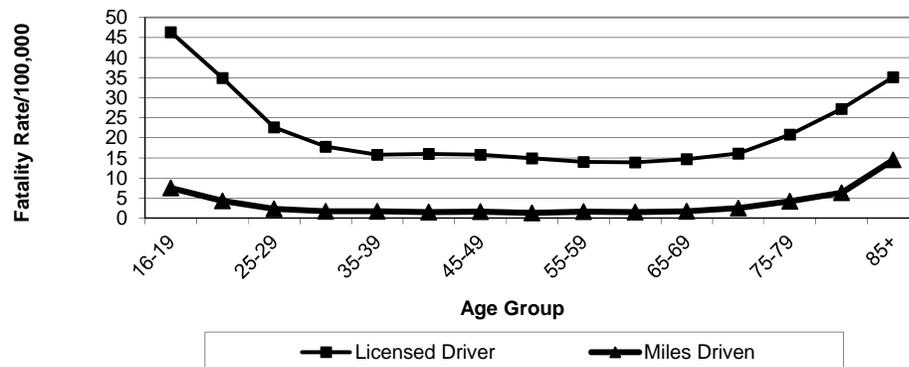


Figure 4.1 US driver fatality rates per 100,000 persons by age group (Insurance Institute for Highway Safety, 2007; FHWA, 2008)

Young Western Australians are similarly over-represented in road crashes. During the period 1995-2004, persons aged 17-24 years accounted for 23% of all road users involved in a police-recorded crash (Hill, Marchant & Roche 2006) while representing only 11% of the Western Australian resident population at the midpoint of the period, 1999 (ABS, 2009). This over-representation held for both males (24% of crash-involved males) and females (25% of crash-involved females). The most recent police reported crash data for 2010 showed that road users aged 17-24 years accounted for 23% of all male and female road users killed or seriously injured, with

this proportion being similar for males (23.6%) and females (22%) (Hill, Thompson, Yano & Smith, 2012). In relation to drivers only, those aged 17-24 years accounted for 25% of all male and female drivers killed or seriously injured in 2010 (Hill et al. 2012). Young male (26%) and female (24%) drivers accounted for a similar proportion of all aged male and female drivers killed or seriously injured (Hill et al. 2012).

4.2 Factors associated with the high rate of crash involvement

Over the years a wealth of information has been amassed on the many and varied risk factors for the crash involvement of young and novice drivers. The most consistent evidence has related to the risk associated with driver inexperience and age; gender, and risk taking behaviour. In addition to these areas, there is increasing evidence of the influence of parental behaviour on the driving outcomes of their children. (e.g., Bianchi & Summala, 2004; Ferguson, Williams, Chapline, Reinfurt & Leonardis, 2001). The role of parental influence is particularly relevant to this review because parents' behaviours in other areas such as smoking, alcohol and illicit drugs are also known to influence the behaviour of their children in these areas (Li, Pentz & Chou, 2002). The main findings for these four areas will be summarised in the following sections.

4.2.1 Inexperience and age

Experience and age are critical crash risk factors for drivers. Because driver age and driving experience (years of licensing) are highly correlated (Simpson, 1996), descriptive accounts of the crash involvement of drivers by broad age grouping are unable to reliably demonstrate the relative contribution of age related factors and experience related factors to crash involvement. Driver age can be considered a proxy for experience (Catchpole, Cairney & Macdonald, 1994) with older age drivers assumed to have more years of experience than younger age drivers. Declining rates of crash involvement with increasing driver age cannot however be simply attributed to increasing driving experience. As drivers age and gain more experience, they are also maturing in ways (e.g., physical, psychological, and social) that contribute to their declining risk of crash involvement (Simpson, 1996). The ability to disentangle the relative effects of age related and experience related factors is perhaps the most vexing issue in young driver research.

One of the first investigations of the relationship between age, experience and crash risk was undertaken by Forsyth et al. (1995). In this cohort study of newly licensed British drivers aged 17 to 40+ years, self-reports of crash involvement (all types) per year up to three years post-licensing were used to calculate the crash rate per million miles travelled for each year of licensing. It was found that the rates of involvement for all-age newly licensed drivers at the end of three years of licensing was linearly related to years of licensing for both males and females, with rates per million miles travelled declining with each additional year of licensing. Forsyth et al (1995) also reported that for each year of the study, crash rates per million miles travelled were linearly related to age at licensure, with the youngest age drivers (17-19 years) evidencing the highest crash rates per million miles travelled and the oldest age drivers (40+ years) the lowest. Multivariate analyses also showed that the percentage reduction in crashes from year one to year two was linearly related to age at licensure, with the youngest drivers showing the greatest percentage reduction compared with the oldest drivers (43% for drivers aged 17 versus 3% for drivers aged 40+). Based on their analyses, Forsyth et al (1995) further concluded that "...for young drivers the effect of experience in reducing accident liability in the first year is at least four times the effect of [an additional year] of age" (p. 32).

Other North American studies have found that crash risk reaches its highest point immediately after teens obtain full driving privileges and then declines rapidly as their driving experience increases, and secondly, that older-age newly licensed drivers are similarly *less likely* to crash than younger novice drivers. Mayhew, Simpson & Pak (2003), for example, examined the crash records of new drivers, regardless of age, in Nova Scotia, to calculate the month-by-month changes in crash rates during the first two years of licensure. The study found that the crash rate was highest during the first month of licensure (123 crashes per 10,000 novice drivers) and decreased rapidly over the next five months (73 crashes per 10,000 novice drivers). Monthly crash rates then gradually decreased over the next 1.5 years. When monthly crash rates were compared across novice drivers of different ages, the 16-year-old drivers had significantly higher rates of monthly crashes than did 17-, 18-, or 19-year-olds.

The preceding findings were supported by McCartt, Shabanova & Leaf (2003) who studied young-novice-driver crashes during the first six months of licensure in

several communities in Connecticut, Delaware, New Jersey, and New York using self-reported measures collected in phone interviews. This study found that crashes per 10,000 miles driven were highest during the first month of licensure and decreased rapidly during the next four months for both male and female drivers. The study also examined crash rates as a function of cumulative miles driven after licensure. The study found that crash rates for both sexes were very high during the first 250 miles driven and decreased up to about the first 1,000 miles driven, with another rapid decline in crash rates occurring between 2,500 and 3,000 cumulative miles driven.

An inverse relationship between driving experience, increasing age and crash involvement has similarly been noted for Western Australian novice drivers. A five-year follow-up of the population of drivers first licensed at 17 years of age in 1998 found that the rate of involvement of drivers in a police reported crash steadily declined from the first month of licensure to the 60th month when the cohort would be at least 21 years of age (see Figure 4.2). Novices were 60% more likely to crash in the first six month of licensing compared with the second six months and 2.4 times more likely to crash in the first year of driving compared with the 5th year of driving (Palamara, 2005).

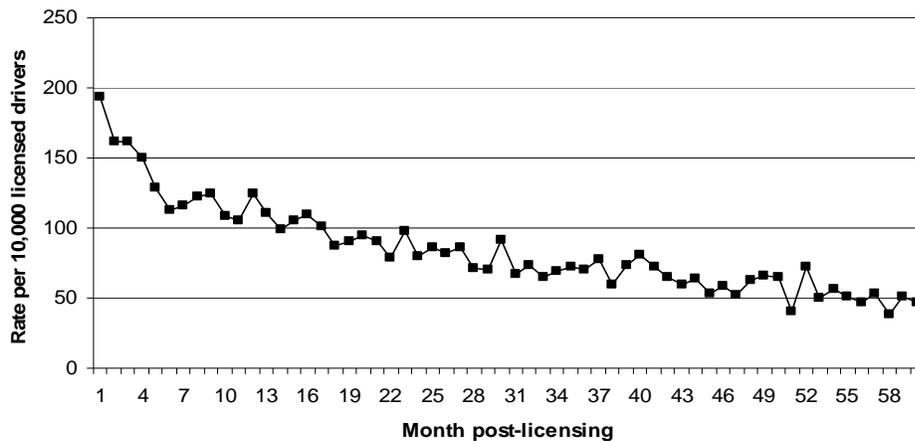


Figure 4.2 Rate of police recorded crash involvement for Western Australian drivers first licensed at 17 years of age in 1998; by month of licensure up to 60 months post licensing (source: Palamara, 2005)

Collectively, the above studies show the critical roles both age (which is a proxy for maturity) and driving experience play in the likelihood of a crash for newly licensed drivers, internationally and locally. The research by Forsyth et al. (1995) shows that

reductions in crash risk over time have higher associations with increasing experience, particularly for younger novice drivers, than increases in driver age (i.e., maturation) per se. Notwithstanding this finding, age or maturation is not an irrelevant factor to the outcomes of young novice drivers because neuromaturation and psychosocial development are known to be inextricably linked to the risk taking behaviour of adolescents (Johnson, Sudhinaraset & Blum, 2010).

4.2.2 **Gender**

Males dominate the traffic crash problem of young novice drivers. According to OECD (2006) data, teen crashes in member countries are three times higher for males than for same-age females. In Australia for example, the driver fatality rate per 100,000 population in 2009 for males aged 17-25 was over three times that for young females: 10.3 *versus* 3.1 (BITRE, 2010). Even when the crash rates of young males and females are adjusted for driving exposure males still have more crashes per distance travelled than young female drivers, a difference that is present across countries (Kweon & Kockelman, 2003; Lynam et al. 2005; Massie, Green, & Campbell, 1997; OECD, 2006).

In Western Australia, males similarly account for the greater proportion of drivers killed or seriously injured. In a 2009 study by Oxley et al. (2009) of police reported crashes linked with hospitalisation and death records showed that males accounted for 78% and 63% of drivers of light passenger vehicles aged 16-24 years respectively killed and hospitalised. The most recent 2010 police reported crash data for drivers killed or seriously injured showed that 58% of drivers aged 17-24 years were male (Hill et al. 2012).

In summary, there is strong and consistent evidence internationally and locally that young male drivers have a greater risk of being involved in a crash and being injured than same aged female drivers. This finding however, reflects the trend for drivers of all ages where males are more likely to be involved in motor vehicle crashes and to be injured. Exactly why young male drivers are more likely to crash than same aged females, even when driving exposure is taken into consideration, is thought to be due in part to their greater engagement in risky driving practices (Insurance Institute for Highway Safety, 2011).

4.2.3 Risk taking and driver behaviour

There is unequivocal evidence that driving behaviours such as speeding and drink driving increase the risk of crash involvement for young drivers. In contrast, there is less certain evidence that all instances of such behaviours are deliberate and motivated by personal gain rather than being unintentional mistakes or the result of inexperience (Williams, 1998). Williams (1998) suggests that the “circumstances of some of the crashes of young people appear to reflect primarily thrill-seeking...” (p. 225) while others are more likely related to inexperience even though they may *appear* to be motivated by deliberate risk taking (e.g., travelling too fast around a bend).

As previously discussed, the developmental stage of adolescence and young adulthood is characterised by an increased propensity to engage in risk taking behaviour (Johnson et al., 2010; Zuckerman, 1994) and when coupled with a lack of driving experience, this propensity can further increase the risk of crash involvement for *some* young novice drivers. The investigation of young driver risk taking has been dominated by two main approaches. The first has been the investigation of the types and incidence of on-road risky driving behaviours and their correlates. The second approach has been the investigation of ‘personality’ correlates of young drivers to potentially explain individual differences in the frequency of risky driving behaviours and to identify a subgroup of particularly problematic young drivers (previously described as the *young problem driver*). Both issues are pertinent to this review and will be addressed in the following sections, beginning with a review of the relationship between driving behaviour and the construct of sensation seeking that was introduced in Section 3.7.

4.2.3.1 *Sensation Seeking: An individual difference factor for on-road risk taking*

As described in Section 3.7, high sensation seekers might perform risky behaviours simply to experience a situation in which physiological arousal will be elevated. In relation to driving, sensation seeking has been consistently associated with a number of risky behaviours among the young and even older drivers internationally (Jonah, 1997).

In the population of college age and younger drivers, research has shown that self-reported impaired drivers, drivers convicted multiple times for drink driving, and

those arrested for drink driving following a collision or violation scored significantly higher on a measure of sensation seeking (the Sensation Seeking Scale) than those in comparison groups (Arnett, 1990; Arnett, Offer, & Fine, 1997; Lastovicka, Murray, Jochimsthaler, Bhalla, & Scheurich, 1987; McMillen, Adams, Wells-Parker, Pang, & Anderson, 1992). Scores on the Sensation Seeking Scale (SSS) have also been shown to correlate positively with driving speed (e.g., Arnett, Offer, & Fine, 1997; Clement & Jonah, 1984; Jonah, Thiessen, Au-Yeung, & Vincent, 1997; Lajunen & Summala, 1996; Zuckerman & Neeb, 1980) and to be related to non-use of seat belts (Beirness, 1995; Clement & Jonah, 1984; Jonah, Thiessen, Au-Yeung, & Vincent, 1997; Wilson & Jonah, 1988).

The relationship between sensation seeking and on-road risk taking behaviour has similarly been noted for young novice drivers in Australia. The previously mentioned study of newly licensed 17 year olds in New South Wales found that driver rankings on the measure of Impulsivity and Sensation Seeking were linearly related to (illegally) driving on the road prior to obtaining a learner-driver permit, with drivers ranked high and moderate being 40% and 20% respectively more likely than low sensation seekers to drive unlicensed (Senserrick, Chen, Boufous, Ivers, Stevenson & Norton, 2010). Unpublished findings from the same study also showed that sensation seeking was linearly related to the frequency of driving 70km/hour in a 60km/hour speed zone; driving while 'texting' on a mobile telephone, and not wearing a seat-belt (H. Y. Chen, personal communication, 2011). In all cases drivers ranked as high sensation seekers were significantly more likely than those ranked as moderate and low to engage in the aforementioned risk behaviours. In addition to this, the frequency of these risky behaviours was highest among high sensation seeking males compared with high sensation seeking females (H. Y. Chen, personal communication, 2011).

In Western Australia, sensation seeking has also been found to be significantly associated with both crash involvement and self-reported risky driving behaviour 12-months post licensing for a cohort of n=1,794 metropolitan and rural youth first licensed at 17 year of age over the period 1995-1997 (Stevenson & Palamara, 2001). In this study sensation seeking was measured at the time of licensing using the Impulsivity and Sensation Seeking scale (Zuckerman, 1994). Drivers categorised as high sensation seekers were found to have a 61% increased risk of involvement in a

police reported crash in the first 12 months of driving compared with those who scored low to moderate on the scale.

The increased risk of crash involvement for the high sensation seeking Western Australian novice drivers may have been mediated by, among other factors, their increased likelihood of speeding and secondly, their willingness to drink and drive. With respect to speeding, investigation of only the metropolitan resident drivers (n=1,277) found an independent significant linear relationship between sensation seeking rankings and the total number of police recorded speeding offences in the first 12 months of driving (adjusted for socioeconomic status, gender and other factors). Compared with novice drivers ranked low on sensation seeking, the incidence rate of police recorded speeding offences was 65% and 2.5 times higher among drivers respectively ranked moderate and high on sensation seeking (Palamara, 2003).

Further investigation of the same group of metropolitan resident novice drivers also noted a statistically significant linear relationship between sensation seeking rankings and self-reported drink-driving at 12 months post licensing (Palamara et al. 1997). Drivers were asked if they had driven whilst believing they had exceeded the legal Blood Alcohol Concentration (BAC) limit in the preceding 12 months ('one or more times' *versus* 'never'). Multivariate analysis showed drivers who were ranked as moderate and high sensation seekers were respectively 1.5 and 2.8 times more likely than those ranked as low sensation seekers to have driven whilst believing they were in excess of the legal BAC limit (adjusted for gender, frequency of alcohol consumption and other factors).

To conclude, sensation seeking is a relevant construct in the understanding of young driver risk taking and crash involvement, both theoretically and empirically. Sensation seeking scores are noted to peak during adolescence and young adulthood and are higher for males compared with females. These findings parallel the high occurrence of crashes among young drivers, particularly young male drivers. Evidence from studies conducted elsewhere and in Western Australia show that sensation seeking scores are (variably) associated with an increased risk of crash involvement and risky driving behaviours such as drink driving, speeding, the non-use of seat belts, and in-vehicle distracting behaviours such as 'texting'.

4.2.3.2 Risk behaviours

Following on from the discussion of individual differences in the disposition to engage in risk taking behaviours, there is consistent, significant evidence across a number of jurisdictions of the relationship between risky driving behaviours and subsequent crash involvement and injury among young drivers. In the following sections the risky driving behaviours of drink driving; speeding; non-use of a seat-belt; distracted driving, and unlicensed driving are reviewed.

Drink driving

Alcohol is a risk factor for young driver crashes and injury for a number of reasons. Firstly because drink driving is often combined with other risky behaviours such as driving at night, driving with teen passengers, speeding, and a lack of seat belt use (Williams, 2003). Secondly, because even at very low levels of Blood Alcohol Concentration (BAC) the driving skills of young novice drivers are likely to be affected and they are more likely to crash compared with older and more experienced drivers with similar BAC levels (see review by Palamara, Adams & Gavin, 2004). This section will review the information on the involvement of alcohol in the crashes of young drivers; the prevalence of drink driving among (non-crash involved) young drivers, and the risk factors associated with drink driving among young adults.

The analysis of young driver crashes shows that alcohol is a significant risk factor. For example, a study using a census of fatal crashes in the US found that drivers aged 16-20 years are at a higher risk of a fatal crash at *any* level of blood alcohol concentration (BAC) when compared to drivers of other ages (Preusser, 2002). Even for BACs as low as 0.01gm%, drivers aged 16-20 had a fatal crash injury risk of 4.37 compared to a risk of 2.18 for drivers age 21-24.

Although drink driving is a significant risk factor for young driver crashes in the USA, it is less common among those under the US legal drinking age (21 years) than for those aged 21-40. For example, a study of convicted drink drivers in Michigan, US found that while young people were over-represented in drink driving convictions, those drivers aged 21-40 had a much larger over-representation when compared to the general population and accounted for nearly two-thirds of the convictions (Eby, 1995). Other estimates of the prevalence of drink driving among non-crash involved drivers in the US has used data from a comprehensive annual

nationwide survey of young people (known as *Monitoring the Future*) (O'Malley & Johnston, 1999). In this study, a nationally representative sample of 17,000 12th graders answered questions about the use of alcohol and driving. The study found that the percentage of students indicating that they had ridden with a drinking driver or drove after drinking in the past two weeks decreased significantly throughout the 1980s and then levelled off. The prevalence of driving after drinking was 18.3% in 1997 and 26.1% for riding with a driver who had been drinking.

O'Malley and Johnston (1999) also analysed the characteristics of those who reported various drink driving behaviours. Those who reported driving after drinking were significantly more likely to be male, to live in the Northwestern or Southern parts of the US and in large population areas, to be White or Hispanic, to have low grades, and to use other illicit drugs. In addition to these ethnicities, a significantly higher incidence of self-reported drinking driving convictions was reported by both young males and females whose parents used alcohol and those whose peers used alcohol. Further to this, among the study sub-group whose parents used alcohol, being drunk in the previous year (a measure of alcohol 'abuse') and previous use of marijuana (for females only) significantly increased the odds of a self-reported drink driving conviction. Exactly how or why parents' and peers' use of alcohol influenced drink driving by youth and young adults in the USA was not addressed in the study but was speculated by the authors to be related to social learning or modelling.

In Australia, alcohol as a cause of driver fatalities has declined over time but still remains a significant risk factor, particularly for younger drivers and males (ATSB, 2004). The most recently published analysis of Australian alcohol and fatal driver injury data shows that in 1999 less than one quarter of all drivers killed had a BAC exceeding 0.05gm%. This proportion was highest, however, among drivers aged 17-25 years (32.1%) and 26-39 years (32.7%) compared with those aged 40-49 years (17.2%) and 60+ years (4%) (ATSB, 2004). In the youngest age group, around 34.5% of male drivers killed evidenced a BAC exceeding 0.05gm% compared with 23.4% of same aged female drivers killed (ATSB, 2004).

Alcohol is similarly a problem for young drivers and males in Western Australia. Rosman, Ferrante & Maroom's (2001) analysis of alcohol related crashes (i.e., involving an associated charge for drink driving) over the period 1987-1995 found

that drivers aged 18-25 years were involved in 25% of crashes though represented only 16% of licensed drivers during this period. Their odds (OR=3.09) of involvement in an alcohol related crash were the highest of all age groups investigated. The most recent police recorded crash data for 2010 shows that young drivers/riders are more likely than older drivers/riders to be involved in alcohol related crashes (where driver/rider Blood Alcohol Concentration level was known) resulting in death or hospitalisation. In regard to fatal crashes, 38.6% of young drivers and riders involved recorded a BAC level above zero, compared with 23.9% of drivers/riders aged 25+ years (Thompson et al., 2012).

With the exception of Victoria where drivers are licensed at 18 years of age, many Australian novices obtain a licence at 17 years of age and have at least one year of driving experience prior to the legal drinking age of 18 years. Furthermore, all novice drivers in Australia are effectively subject to a zero Blood Alcohol Concentration level for the duration of the provisional driver licensing period (up to three years post licensing). These driver licensing and drinking age regulations have proven to be reasonably effective in reducing the incidence of drink driving in the earliest years of driving. Indeed, drink driving data from two Australian states, South Australia and Queensland, suggest that drink-driving is reasonably infrequent among the youngest novice drivers (under or around the legal drinking age) but increases with age and legally sanctioned drinking and corresponding driving experience. It is also greater among males than females. In South Australia, just under 1% of drivers aged 16-19 years who obtained a provisional licence during the period 1998-2001 were charged with a drink driving offence in the first year of driving. After three years of licensure this percentage increased to 2.99% (Kloeden, 2008). At 12-months post licensure, the odds of incurring a drink-driving offence were significantly higher for drivers licensed at age 19 (OR=3.2), age 18 (OR=3.6) and age 17 (OR=1.6) compared with drivers aged 16 years. The effect of age was still significant at 24-months, though reduced, and no longer significant at 36-months post-licensing. In this study the effect of gender was also significant, with the odds of males incurring a drink-driving offence being significantly and consistently higher at 12-months (OR=4.9), 24-months (OR=4.8) and 36-months post licensing (OR=4.3) (Kloeden, 2008). In Queensland, an analysis of drink driving offences over a seven year period up to

2008 showed that offenders were most likely to be aged 20-29 years and male (Department of Transport and Main Roads, 2010).

Unfortunately there has been very little research in Western Australia of the incidence of behavioural and psychosocial risk factors for (non-crash related) drink driving among young drivers. One of the earliest studies by Rosman et al. (2001) of drivers apprehended for drink driving noted that 43% of the incidents over the period 1987-1995 involved a driver aged 18-25 years. Other analyses of the same data showed that drivers aged 17-25 years with an initial conviction for drink driving had the highest relative risk (RR=1.64) of all age groups of involvement in a future alcohol related crash and were significantly more likely to experience this crash sooner than other age groups (Ferrante, Rosman & Marom, 2001). This finding, though somewhat historical, underlines the importance of countering drink drinking and dealing effectively with offending drivers to reduce recidivism and the increased risk of crash involvement.

Other Western Australian studies involving 17-year-old drivers residing in metropolitan Perth (Palamara et al. 1999) found that 93.5% considered they were unlikely to drive in their first year of licensing while exceeding the legal Blood Alcohol Concentration level. Significant differences were noted however between males and females on various drink-driving issues. Males (14.9%) were significantly more likely than females (7%) to consider they would *not* be caught and somewhat more likely to consider they would not crash (8.8% versus 5%) if they drove while exceeding the legal BAC (which at the time of the survey was 0.02gm%). After 12 months of driving 29% of the cohort reported that they had driven while *believing* themselves to be in excess of the legal BAC level, with a slightly higher proportion of males (32.4%) than females (26.4%) believing they had done so.

Additional multivariate analysis of self-reported drink driving data (categorised as 'never' *versus* 'one or more times') by the above group identified a number of significant independent predictors (after adjusting for driver sex). In addition to the previously reported linear relationship between sensation seeking and drink driving, the frequency of self-reported alcohol consumption, self-rated driving demeanour, and unlicensed driving prior to provisional licensure were significant predictors of self-reported drink driving. Novice drivers who reported drinking more than once a

week were nine times more likely than drivers who did not drink to report exceeding the legal BAC level. Secondly, novice drivers with a moderate to high level of positive driving demeanour (e.g., those who described their driving style and skill as cautious, tolerant, defensive, patient, and unhurried) were 36%-70% *less* likely to report drink driving than drivers with a self-reported low level of driving demeanour (e.g., those who described their driving style and skill as risky, intolerant, aggressive, impatient, and hurried). Finally, novice drivers who reported illegally driving on the road six or more times prior to obtaining a learner-driver permit were nearly three times more likely to report drink driving in the first year of licensing compared with drivers who did not drive illegally prior to a learner driver permit (Palamara et al., 1999). While these findings cannot be regarded as representative of the novice driver population per se and should be interpreted cautiously because of the subjectivity of the outcome measure, they do highlight the potential risk for drink driving among this population and the relational nature of risk taking and anti-social behaviour on the road for this age group.

A more recent survey of the drink driving related attitudes of young Western Australians indicates that some young drivers are at *potential risk* of drink driving. The 2011 *I Generation Research* survey of Western Australian youth aged 18-30 (Hepworth, Scerri & Young, 2011) showed that some young adults, particularly males, still consider it acceptable to drive when over the legal BAC limit for their licence type. Approximately 11% of 18-30 year old males compared with 2% of females considered that it was *always* or *sometimes* acceptable to drive whilst over the legal alcohol limit.

In summary, though young drivers do not engage in drink driving to the extent of other older age groups, the prevalence is still relatively high and they are more likely to be involved in a serious crash when they do drink alcohol and drive. This is possibly due to their lack of driving experience coupled with their lower tolerance of the effects of alcohol. Other evidence shows that males more so than females (irrespective of age) have a higher risk of drink driving. In addition to this, there is some research, both local and elsewhere, to suggest that drink driving among the young is associated with the use of alcohol by parents and peers, other risk taking behaviours (e.g., unlicensed driving; illicit drugs; alcohol) and with certain personality and driving behavioural styles.

Speeding

Speeding - defined as driving faster than the posted limit or that is safe for the prevailing conditions - exacerbates a number of problem behaviours among young drivers. A speeding driver has less time to react to changing traffic conditions and reduce the amount of time and space required to stop; increased speed also increases the forces imparted on a body during a crash, resulting in greater injury. Like other young driver crash risk factors, speeding is often combined with other risky behaviours.

Analyses of crash databases consistently show that speed is a contributing factor in young driver crashes. For example, McKnight & McKnight (2000) estimated that speeding was a factor in about 20% of young driver crashes in two American states. Numerous investigations of Australian population crash data bases have found that young drivers are over-represented in injury crashes when travelling above the speed limit or at excessive speeds (Catchpole et al., 1994; Macdonald, 1994) and where the circumstances of the crash suggest that speed was likely to be involved (Harrison, Triggs & Pronk, 1999). For example, in the study by Harrison et al. (1999) of young Victorian drivers nearly 30% of crashes involving young male drivers and about 20% of crashes involving young female drivers were judged to be speed related.

In Western Australia, the analysis of driver fatalities for the period 1995-2004 and 2006 respectively undertaken by Hill et al. (2006) and Marchant, Hill, Caccianiga & Gant (2008) underline the risks associated with speeding by young Western Australian drivers. Though drivers of this age group represent around 14% of drivers licensed in WA, they accounted for 42.5% (1995-2004) and 45% (2006) of drivers killed where speed was judged by attending police to be a contributing factor. Second to this, compared with drivers aged 26+ years, young driver fatalities were more frequently associated with speeding in the period 1995-2004 (45% *versus* 26%) (Hill et al., 2006) and 2006 (49.3% *versus* 26%) (Marchant et al., 2008). Both studies also provided evidence to support the conclusion that young male drivers are more likely to speed compared with same aged female drivers. During the periods 1995-2004 and 2006, 49.6% and 55.5% of all young male driver deaths were attributed to speeding compared with 30.6% and 21.4% of young female driver deaths (Hill et al. 2006; Marchant et al., 2008).

Self-reports of speeding also confirm that speeding is also a substantial problem among young drivers, particularly males. The investigation of the driving behaviour of n=1,135 participants aged 19-20 years for the Australian Temperament Study (Smart & Vassallo, 2005) observed that speeding was the most commonly self-reported unsafe driving behaviour, with around one-third of drivers reporting being caught one or more time for speeding since first licensure. Around 80% of the sample of young drivers claimed to have exceeded the speed limit by up to 10km/hour and 50% by 10-25km/hour at least once in their last ten driving trips. Consistent with the crash and speeding data, young males (40%) were significantly more likely than females (24%) to have been caught speeding and were significantly more likely to be recidivist speeders (17% versus 6%).

In Western Australia, a series of telephone surveys of road safety risk factors consistently observed that drivers aged 17-25 years were more likely than drivers aged 26+ years to report having exceeded the speed limit by 10km/h in the preceding two-week period (Cercarelli, Hendrie, Dyke & Ryan, 1997; Cercarelli, Hendrie, Legge & Ryan, 1997; Cercarelli, Hendrie, Ryan, Legge & Kirov, 1997; Cercarelli, Hendrie, Ryan, Legge & Kirov, 1998). A more recent survey of young Western Australians reported by Hepworth, Scerri & Young (20011) found that around 48% of males and 32% of females aged 18-30 years considered that it was 'sometimes' to 'always' acceptable to exceed the speed limit.

Investigations of the speeding offences of young drivers provide additional, objective evidence of the problem. In South Australia, around 8% of a population based cohort of provisional novice drivers had incurred at least one speeding offence within the first year of driving, increasing to 20% within two and half year of licensure (Kloeden, 2008). Once again, males were significantly more likely than females to commit a speeding offence, ranging from a ratio of nearly 3.5 times the offence rate in the first three months of driving to just over 2.5 times at 30 months post licensing (Kloeden, 2008).

Two Western Australia studies of police issued speeding offences similarly confirm the high incidence of speeding among young drivers, particularly males. The investigation by Rosman (2000) of offences for 'excessive' speeding (20km/hour or more) for the period 1996-1998 showed that the incidence of offences, both single

and repeat, was highest among drivers aged 17-19 years and declined with increasing driver age. A significant difference was also noted between young males and females in the incidence of offending, with male drivers aged 17-19 years evidencing the highest rate of offending (350 offences per 1,000 licensed drivers) for this period of all driver age groups and sexes. Rosman (2000) also found 'excessive' speeding to be a significant risk factor for subsequent crash involvement, in that drivers who were apprehended for 'excessive' speeding before the age of 20 were twice as likely as older age drivers to be involved in a subsequent casualty crash in the two-year follow-up period of investigation. Findings of this nature affirm the importance of deterring young driver speeding to reduce the risk of subsequent crash involvement.

In the second study, police recorded speeding offences up to three years post licensing for n=1,277 drivers first licensed at 17 years of age in metropolitan Perth were analysed by Palamara and Stevenson (2003). The cumulative proportion of the cohort incurring one or more Traffic Infringement Notices (TINs) for speeding was 27%, 53% and 66% respectively at 12, 24 and 36 months after issue of licence. As shown in Table 4.1, the annual incidence rate of infringing drivers per 10,000 licensing days was significantly lower in the first year of driving compared to years two and three, with the highest rate for all drivers recorded in year two (14.4 infringing drivers per 10,000 driving days). As Table 4.1 also shows, the incidence rate was significantly higher among males compared with females in each of the three years of investigation. Further analysis of offences at 12 months post licensing showed that a significantly greater proportion of offences committed by males (51.6%) were in the 20km/hour or higher range compared with 29.7% for females (Palamara, 2003). Thus, not only are young males more likely than same aged females to speed, they are also more likely to engage in higher levels of speeding.

Table 4.1 Incidence rate per 10,000 licensing days of 17 year old Western Australian novice drivers receiving one of more Traffic Infringement Notices for speeding; by year of driving and gender

Year of Driving	Number of Infringing Drivers	Rate/10,000 licensing days	95% Confidence Interval
Year One			
Males	174	10.7	9.1-12.3
Females	168	6.8	5.8-7.9
All drivers	342	8.4	7.5-9.2
Year Two			
Males	263	18.4	16.2-20.7
Females	260	11.7	10.3-13.2
All drivers	523	14.4	13.1-15.6
Year Three			
Males	221	15.0	13.1-17.0
Females	251	11.4	10.0-12.8
All drivers	472	12.8	11.7-14.0

Source: Palamara & Stevenson (2003)

In addition to the previously identified effect of sensation seeking and male gender on speeding, research has identified other notable correlates for young driver speeding. For example, the Australian Temperament Study (Smart & Vassallo, 2005) reported a number of significant differences on measures taken at mid-late adolescence and early adulthood for drivers aged 19-20 who reported multiple speeding offences *versus* single or no offences. In relation to the strongest effects, multiple offenders were significantly more likely to report anti-social behaviour (mid-late adolescence and early adulthood), to associate with anti-social peers (early adulthood), and to have incurred a higher number of other driving offences (early adulthood). Smaller but still significant effects for the multiple offence group included a higher level of involvement in the criminal justice system, a history of unemployment, and higher multi-substance (i.e., alcohol, marijuana) abuse.

In Western Australia, a multivariate analysis of the total number of TINs for speeding at 12 months post-licensing identified a number of significant independent predictors (Palamara, 2003). In addition to the previously discussed effect of sensation seeking on the total number of speeding offences, independent effects were also noted for driver sex, self-ratings of driving style and skill, and the self-reported practice of health related behaviours. After adjusting for driver socioeconomic status, the incidence rate of speeding offences was 48% *higher* among males compared with females; 82% *higher* among drivers ranked as highly confident and adventurous

drivers (compared with those ranked moderate to low), and 39% and 31% *lower* among drivers who respectively practised a high and moderate level of positive health related behaviours compared with those who practiced a low level of self-reported positive health related behaviour. In this study the practice of health-related behaviour was based on self-reports of smoking, consumption of alcohol, and the use of exercise and sunscreen. Drivers who were ranked high on this measure did not smoke, did not drink or drank very little alcohol, exercised regularly each week, and nearly always used sunscreen.

In summary, speeding is a significant risk factor for young drivers, particularly males, as evidenced by the ‘judged’ contribution of speed to their crashes and their higher incidence of self-reported speeding and police issued speeding offences. Young drivers who speed appear to have a higher disposition to sensation seeking, to be anti-social, and to engage in other health risk behaviours such as multiple substance abuse, and to have committed other driving offences. Local research also shows that young driver speeding offences significantly increase the risk of a subsequent crash for the driver.

Failure to wear a seat-belt

As has been reported elsewhere (e.g., Oxley et al. 2009), the use of an adult seat belt can significantly reduce the risk of serious injury in the event of a crash. One major contributing factor to the high rate of fatalities among teens in some countries is the low rate of seat belt use by young people compared with older age groups. Information on seat belt use is derived from roadside observation surveys of seat belt use; self-reports of seat-belt use, and police the reports of seat belt use by those involved in a crash.

Roadside observation surveys conducted in the US consistently show low belt use for young vehicle occupants. For example, a 2003 nationwide direct observation survey of seat belt use in the US showed that males age 16-24 had 72% belt use compared to 77% belt use for all males, while young females (age 16-24) had 77% belt use compared to 84% use for women in the US (Glassbrenner, 2004). A 15-year analysis of belt use by age group in Michigan, showed that belt use for both drivers and passengers age 16-29 was consistently lower than for other age groups, with as much as a 25% point difference in use in some years (Eby, Molnar, & Olk, 2000). Similar

direct observation data for large geographic regions outside of the US are difficult to locate, but local area surveys in Europe and other countries tend to show low belt use for young people, particularly males (OECD, 2006).

US studies of self-reported seat-belt use and belt use by crash involved occupants confirm that younger age occupants, including drivers, are less likely to wear a seat-belt. Boyle & Lampkin's (2008) national US survey of belt-use found that self-reported usage was lowest among drivers aged 16-20 years (82%) and 21-24 years (80%) compared with all other older age drivers, with the highest reported prevalence being among drivers aged 65+ years (92%). A somewhat earlier investigation by Williams & Shabanova (2002) of US drivers killed between 1995 and 1999 noted that usage was somewhat lower among those aged 20-29 years (29%) compared with those aged 16-19 years (36%), 30-44 years (30%) and 45-64 years (40%).

The international review of the literature on seat-belt wearing conducted by Oxley et al. (2009) did not specifically report on the prevalence of use among young drivers by gender but did note however, that studies outside of Australia generally report a much lower prevalence of use among males of all ages compared with same aged females, irrespective of the source of the information (i.e., observation, self-report or crash data).

Unfortunately there have been no recent Australia-wide roadside observation surveys of seat-belt use to objectively estimate the contemporary prevalence of belt-use among the young driver age group. The most recent survey of *self-reported* seat-belt use noted only minor, non-significant differences in the prevalence of usage among drivers/front seat passengers of varying ages from aged 15+ years (ranging between 96% and 98%) (Pennay, 2008). The review by Oxley et al. (2009) did note that for crash involved occupants in Queensland, including drivers, non-use was highest among those aged 25-39 years (39%) and 17-24 years (31%) compared with those aged 40-45 years (22%) and 60+ years (23%). From their review of studies of crash reports, Oxley et al. (2009) also concluded that adult males are more likely than same aged females to be unbelted, irrespective of age and seating position.

With respect to Western Australia, various sources of information are available to estimate the use and non-use of a seat-belt by young drivers. The first source of information is provided by roadside observations of usage. The most recent of these studies by Roberts, Taylor & Sidebottom (2006) found a slightly higher incidence of non-use of a seat belt among Western Australian drivers aged 17-29 years (2.2%) compared with drivers aged 30-59 years (1%) and 60+ years (0.6%). Whilst this study did not report non-use for age groupings by occupant position cross tabulated by gender, the authors did note that overall, non-use by adult males (2%) and females (1.3%) did not significantly differ.

Traffic offence data is an additional source of objective information on the non-use of seat-belts by young drivers in Western Australia. Palamara's (2006a) investigation of TINS issued to drivers over the period 2001-2004 for failing to wear a seat-belt found that those aged 16-24 years incurred 38.3% of TINS issued to drivers (which exceeds the ~14% of licensed drivers they represent), compared with 35.7% and 26% of offences respectively incurred by drivers aged 25-39 and 40+ years. Not so surprisingly, the incidence of repeat offences committed by drivers aged 16-24 years was 61% higher than that of drivers aged 40+ years and 47% higher than that for drivers aged 25-39 years. Unfortunately the report did not investigate differences in offending between younger age male and female drivers, but did note that for all age drivers males incurred approximately three-quarters of all TINS for failing to wear a seat-belt and were more likely to be repeat offenders (7.5% *versus* 4.8%).

Western Australian crash data provides further evidence of the risk of younger age drivers, and particularly males, of being unbelted. Unpublished findings from a recent investigation by Oxley et al. (2009) of police crash reports linked to death and hospitalisation data, 2002-2007, found that 10.5% of light passenger motor vehicle drivers aged 16-25 years killed or hospitalised were unbelted, compared with 11% of drivers aged 26-40 years and 5.1% of drivers aged 41+ years. Other unpublished analyses of the young driver age group noted a higher rate of non-use among males (14.8%), drivers who were residents of rural Western Australia (15%), and drivers of Aboriginal or Torres Strait Islander background (27%) compared with female drivers (3%), drivers who resided in metropolitan Perth (6.6%), and non-Indigenous drivers (9.6%) (Oxley et al. 2009).

In summary, the non-use of a seat-belt by young drivers appears to be a greater problem elsewhere than it is in Australia. Even so, there is some evidence to suggest that younger age drivers are more likely than much older age drivers (40+ years) to drive unbelted. In addition, there is evidence to suggest that male drivers are more likely than female drivers to not use a seat-belt, though this finding is not necessarily specific to young drivers. Local research also shows that non-use of a seat belt by young drivers killed or hospitalised is higher among the Indigenous and rural area residents.

Driver distraction, inattention and fatigue

The issue of distracted, inattentive, and fatigued driving is an increasing area of concern for traffic safety professionals, particularly with respect to young novice drivers. The combination of inexperience and visual, manual and cognitive distraction is a dangerous combination for this age group (Garner, Fine, Franklin, Sattin & Stavrinou, 2011). Driver inattention, particularly as a result of distracting in-vehicle technologies and behaviours, are an identifiable cause of motor vehicle crashes (Stutts, Reinfurt, Staplin & Rodgman, 2001). Several studies (e.g., Laberge-Nadeau et al., 2003; Redelmeirer & Tibshirani, 1997; Wilson, Fang, Wiggins & Cooper, 2003) have identified the use of a mobile telephone while driving as a source of driver distraction and hence as a risk factor for crash involvement. The National Highway Traffic Safety Administration (NHTSA) has estimated that approximately 25% of crashes are attributed to driver distraction and inattention (Wang, Knippling, & Goodman, 1996).

Nowadays, the use of a mobile phone is a common cause of distraction. Other types of potential driver distraction have been reviewed extensively elsewhere (see for example Eby & Kantowitz, 2006). Use of mobile phones and other portable technologies is increasing in the US and other countries. An analysis of mobile phone use by drivers over a four year period, showed that mobile phone use increased by about one percentage point per year (Eby, Vivoda, & St. Louis, 2006). Unfortunately, in this study there were too few drivers using mobile phones to conduct analyses by driver age. A recent US nationwide direct observation survey, however, showed that 9% of drivers age 16-24 appeared to be using a hand held mobile phone, while another 1% appeared to be using a hands-free phone (NHTSA, 2009). Use of mobile phones by drivers aged 25-69 was about 6%.

Mobile phone use whilst driving also seems to be high among young people in European countries. For example, a study in Sweden found self-reported mobile phone use for people age 18-24 was more than 35%, the highest of any age group (Thulin & Gustafsson, 2004). In this same study, of those who reported using a mobile phone while driving, about 87% of young respondents indicated that they always or almost always drove with their mobile phone turned on and 62% of young respondents reported that they experienced an unsafe driving action (e.g., missed a traffic signal, changed into the wrong lane, or drove at an unsafe speed) because they were concentrating on a mobile phone conversation.

There is limited published information in Australia on the use of mobile telephones by young drivers. In New South Wales, a study of n=20,822 provisional drivers aged 17-24 years asked drivers to estimate the safety of and their frequency of texting or talking on a mobile phone while driving (Ivers et al. 2009). Around 5% and 9.7% of the sample considered that it was always safe to mostly safe to respectively text and drive and talk and drive, with a significantly higher proportion of males than females considering these behaviours to be safe. When asked about the frequency of these behaviours, 2.6% and 2.8% of drivers reported they respectively text while driving and talk while driving 'very often' to 'often' (Ivers et al. 2009). Young female drivers (3%) were significantly more likely than young male drivers (2.5%) to drive while text messaging.

In Western Australia, there is some evidence to show that young drivers are more likely than older age drivers to use a mobile phone while driving, and secondly, to have an increased risk of crashing because of mobile phone use. A telephone survey of mobile phone use while driving found that 18.5% of a sample of drivers aged 18-30 years from NSW and Western Australia reported using a mobile phone while driving, being nearly five times the rate for drivers aged 50-65 years (McEvoy, Stevenson & Woodward, 2006). Interestingly, drivers of all ages who used a mobile phone when driving were less likely to consider phone use, texting, and other known risky driving behaviours (speeding, exceeding the legal BAC level) as dangerous driving behaviours. In an earlier study, McEvoy et al. (2005) reported that Western Australian drivers aged 17-29 years who used a mobile phone (hand held or hands free use up to 10 minutes prior to the estimated crash time) had nearly four times the odds of drivers who did not use a mobile phone of being involved in an injury crash.

A more recent on-line survey of n=600 Western Australians aged 17+ years (Synovate, 2009) noted that young drivers aged 17-24 years engaged in a number of potentially distracting behaviours, including mobile phone use, and held a number risk-related attitudes toward driving distractions. For example, younger age drivers (25%) were significantly more likely than all age drivers to report that they ‘often’ changed a CD when driving and read mobile telephone text messages. Further, young female drivers (47%) were considerably more likely than all age female drivers (29%) to engage in potentially distracting behaviours such as applying lipstick or lip gloss.

Drowsy driving is a serious problem that is believed to lead to thousands of traffic crashes each year in the US (NHTSA, 2010) and abroad (OECD, 2006). The problem is particularly difficult to quantify because there is no test that can be administered after the crash to determine drowsiness, unlike impairment from alcohol. Nevertheless, using surrogates of drowsy driving (such as “drifting out of the lane”), US researchers estimated that the drowsy driving crash involvement rate (both by miles driven and licensed driver) was four times greater for drivers under age 30 when compared to older drivers (Knipling & Wang, 1994).

With respect to this last finding, Dahl (2008) considers that the road-related consequences of sleep deprivation is a developing problem among adolescents and young adults as an ever increasing proportion fail to obtain sufficient sleep. He considers that sleep deprivation can increase the on-road risks for young drivers in a number of ways including lapses in attention and sleepiness per se; impaired judgement and decision making that can result in the choice of risky behaviours; a negative interaction between substances such as alcohol and sleep deprivation, and increased reactive aggression that may lead to impulsive and reckless behaviour.

A recent study of self-reported drowsy driving, using a nationally representative sample of drivers in the US, yielded some interesting findings (Royal, 2003). This study found that 18% of drivers age 16-20 and 40% of drivers age 20-29 reported “nodding off” while driving at some time. Of those who reported nodding off, 41% of drivers age 16-20 had done so within the past 6 months, compared to only 21% for drivers age 20-29. The study also asked drivers about the characteristics of trips when they last nodded off while driving. About one-third of respondents reported

that their most frequent drowsy driving incident occurred during daytime - between 6:00 AM and 5:00 PM (these data were not broken out by age group). Finally, respondents were asked if they had been in crash as a result of drowsy driving in the past five years. The two age groups reporting the highest percentages of drowsy driving crashes were the two age groups under age 30 (1.6% for age 16-20; 1.9% for age 21-29; and 0.7% for all ages). Similar results have been reported from a survey of drivers in Ontario, Canada (Vanlaar, Simpson, Mayhew, & Robertson, 2008). Thus, self-report and crash data confirm that drowsy driving is a significant crash factor for young drivers.

Because fatigue as a risk factor for crash involvement is difficult to investigate and to quantify, it is thought to be under-reported as a crash cause (OECD, 2006). Quantifying the role of fatigue in young driver crashes in Western Australia is also difficult because during the period 1995-2004 police had no provision to specifically code 'fatigue' as a contributing factor to crash involvement. Alternatively, the analysis of fatigue as a crash factor is often based on a proxy measure, that being the crashed vehicle's recorded movement as 'out of control: fatigue' (see Hill et al. 2006).

Bearing in mind these limitations and the fact that fatigue related crashes accounted for a very small proportion (1.3%) of total serious injury crashes for drivers/riders during the period (Hill et al. 2006), there is conditional evidence to suggest that fatigue contributed to more serious injury crashes of drivers/riders aged 17-24 years (2.0%) than crashes of those aged 25+ years (1.0%). This proportion was higher for young male drivers/riders (2.5%) compared with young female drivers/riders (1.0%) (Hill et al. 2006). No additional research into the contribution of fatigue to young driver crashes and injury in Western Australia was identified.

To summarise, in-car mobile phone use is a source of driver distraction and inattention and a documented risk for crash involvement among all drivers, not just young drivers. The available evidence suggests that young drivers, including those in Western Australia, are more likely than older age drivers to perceive the use of a mobile phone while driving as safe; to use a mobile phone whilst driving, and to have been using a mobile phone prior to being involved in a crash. Driving whilst fatigued or drowsy is also thought to be a risk factor for crash involvement but due to

the difficulty in objectively measuring these conditions they are most likely under-reported. Thus there is very limited information on these conditions as risk behaviours among young drivers in Western Australia and elsewhere. Finally, there is no consistent evidence to suggest that the incidence of distracted or fatigued driving is higher among young male drivers compared with young female drivers.

Unlicensed driving

Driving while unlicensed (never held, suspended, or revoked licence; driving without an appropriate supervising driver while learning to drive) is an emerging problem in the area of young driver risk taking behaviour. For young drivers, there is reasonable evidence to show that driving unlicensed is associated with other on-road risk taking behaviours and entails a higher risk of crash involvement.

A broad ranging review of unlicensed driving in the USA noted that unlicensed drivers were more likely to be younger and male (Griffin & DeLaZerda, 2000 cited in Committee on Injury, Violence, and Poison Prevention and Committee on Adolescence, 2006). The Committee also reported that among fatally injured teenage drivers, unlicensed drivers compared with licensed drivers were five times more likely to have been previously convicted for drink driving and three times more likely to have had their licence previously suspended (Committee on Injury, Violence, and Poison Prevention and Committee on Adolescence, 2006). Overall, around 15% of US drivers under 20 years of age fatally injured in 2004 were found to have never been licensed or their licence was suspended or revoked at the time of the crash (Committee on Injury, Violence, and Poison Prevention and Committee on Adolescence, 2006).

Information on the prevalence of unlicensed driving in the USA is provided by a nationally representative school-based survey of 5,665; 9th, 10th, and 11th graders on self-reported unlicensed driving (Elliott, Ginsburg, & Winston, 2008). The authors reported a prevalence of 4.2% of respondents admitting to driving while unlicensed for at least one hour per week. The study also found that those who reported driving without a licence tended to be: African American or Hispanic; live in rural or suburban areas; report lower school grades; were less likely to use seat belts; more likely to report driving while impaired; and more likely to report driving for no particular purpose. The study did not find a higher rate of reported crashes.

Australian studies into unlicensed driving by young adults similarly exemplify the riskiness of the behaviour and its relationship with other on-road risk behaviours. The first of these studies to be reviewed was undertaken in New South Wales by Lam (2003) and involved the examination of five years of police-reported crash data to identify crashes involving drivers who were too young (less than 17 years of age) to qualify for a licence (i.e., unlicensed). The study found 526 crashes involving unlicensed drivers. Almost 80% of the drivers in these crashes were male and 84% were killed or injured in the crash. These findings confirm the over-involvement of males in this risky behaviour and the severity of the crashes that unlicensed drivers are involved in.

Another study, again in New South Wales, investigated n=20,822 provisional drivers aged 17-24 years at the time of licensing and considered the issue of unlicensed driving with respect to the self-reported frequency of driving on the road prior to obtaining a learner-driver permit and driving without an appropriate supervisor while on a learner-driver permit (Senserrick, Chen, Boufous, Palamara, Williamson, Stevenson & Ivers, 2011). The authors reported that 22.6% and 25.4% of the sample respectively reported driving prior to obtaining a learner-driver permit and without a supervisor when on L-plates. Approximately 12% of the sample admitted to undertaking both illegal behaviours. Further analysis showed that the incidence of both forms of unlicensed driving was highest among males; those aged 17 years; those residing in rural/non-urban areas; drivers from low socioeconomic areas, and Indigenous youth. Senserrick et al., (2011) also found that driving without an accompanying supervisor while on L-plates was highest for those who engaged in a high level of general on-road risk taking behaviour (as measured by drivers' responses to a range of other 'at risk' behaviours). Finally, this study found that both examples of unlicensed driving were associated with a 20% increased risk of crash involvement within a two-year average follow-up period post licensing. After adjusting for a range of factors, including scores on the omnibus measure of risky driving, unlicensed driving was no longer significantly associated with crash involvement. This finding suggests that unlicensed driving prior to provisional driving is an early indicator of future on-road risk taking behaviour when licensed.

Few studies of unlicensed driving in Western Australia relevant to this age group were identified, thus making it difficult to estimate the prevalence of the behaviour

among young drivers and the factors associated with it. The first of these studies by Stevenson & Palamara (2001) of n=1,796 17 years old drivers residing in metropolitan Perth and rural Western Australia investigated the self-reported frequency of driving on the road prior to obtaining a learner-driver permit and driving without a supervising driver while holding a learner-driver permit. Unpublished findings from the study showed that 34.5% and 21.6% of the cohort respectively reported driving unlicensed and unsupervised one or more times. Males were significantly more likely than females to report driving unlicensed (41% *versus* 29.3%) as were those living in rural Western Australia compared with metropolitan Perth (47% *versus* 29.3%). In contrast, males and females and rural and metropolitan resident drivers were similar in the reported frequency of unsupervised driving. Further investigation of those who drove unlicensed as frequently as daily to weekly prior to obtaining a learner-driver permit found that these drivers reported higher levels of alcohol consumption at the time of licensing and higher levels of self-reported non-sanctioned traffic violations in the first year driving (Stevenson, Palamara, Morrison & Ryan, 2001).

Stevenson and Palamara (2001) also investigated the association between unlicensed and unsupervised driving and police reported crash involvement in the first 12 months of driving. After adjusting for gender, residence, and drivers scores on risk taking (as measured by scores on the Impulsivity and Sensation Seeking Scale), a statistically significant linear relationship was found between the frequency of driving on the road prior to obtaining a learner-driver permit and time to crash within 12 months of licensure. Those that drove most frequently had twice the risk of crashing compared with those who did not drive unlicensed prior to obtaining L-plates (Stevenson & Palamara, 2001).

The investigation by Plunkett (2009) addressed Western Australian drivers who were involved in a crash during the period 2006-2007 where one or more persons were fatally injured. Overall, 17.6% of crash involved drivers were unlicensed. The proportion of unlicensed drivers was somewhat lower in the youngest age groups of drivers -19% and 16.7% among those respectively aged 17-20 and 21-24 years-compared with 26.2% among those aged 25-29 years. Further unpublished analysis by the author found that *all* n=14 fatally injured Indigenous drivers aged 16-29 years

were unlicensed compared with 18.7% of non-Indigenous drivers aged 16-29 years killed.

The preceding summary review of unlicensed driving among youth has identified some variation in the reported incidence and type of behaviour, with the highest incidence being for driving prior to obtaining a learner-driver permit among a non-representative sample of novice drivers in Western Australia. The evidence was more consistent in regard to the association between unlicensed driving and other risk taking behaviour on the road and crash involvement, and the increased likelihood of males and those residing outside metropolitan areas to drive unlicensed.

4.2.4 **The role of parents in the driving styles and outcome of young drivers**

There is increasing evidence that parents can have a significant impact on the driving behaviours and outcomes of their children. The two broad paths of influence by parents concern their capacity to model driver behaviour and secondly, the nature and quality of their relationship with their children, including their role in the management of their children's driving behaviour in the early period of licensure. These areas of influence are particularly relevant for discussion as contemporary graduated licensing schemes place a strong emphasis on the role of parents in relation to supervised driving experience and helping their children manage their exposure to high risk driving scenarios (e.g., night-time driving; travelling with passengers).

A number of studies have reported a significant relationship between the driving record (crashes, traffic offences) of parents and that of their children. For example, Ferguson et al. (2001) reported that the police recorded crash and traffic violation histories of parents (single parent and double parent households) in the US were linearly associated with an increased risk of both crash involvement (up to 22% increase) and traffic offences (up to 38% increase) for young drivers aged 18-21 years. Similarly, a Canadian study (Wilson, Meckle, Wiggins & Cooper, 2006) of drivers aged 16-21 reported that the relative risk of involvement in a police recorded 'at fault' collision in the first three of driving for both young males and females was significantly increased when both parents had a history of police recorded 'at fault' collision (RR=1.35 males; RR=1.32 females) and speeding offences (RR=1.23 males; RR=1.28 females).

Other studies using self-report information on self-rated driving styles and behaviour of parents and their children provide additional support for the proposition that youthful driving styles may be the result of ‘intergenerational transmission’ (Miller & Taubman-Ben-Ari, 2010). In their study of $n=130$ young Israeli drivers and their parents, Miller and Taubman-Ben-Ari (2010) noted significant correlations between mothers and fathers self-rated aggressive driving style and their child’s self-rated reckless ($r=0.63$ mother; $r=0.57$ father) and anxious ($r=0.35$ mother; $r=0.41$ father) driving styles. A more sophisticated Brazilian study (Bianchi & Summala, 2004) of the relationship between parent and young adult child (18-30 years) driving styles adjusted for driving exposure, demographic and lifestyles factors, found mixed results. Parents’ driving style as measured by the Driver Behaviour Questionnaire (DBQ) was significantly related to their children’s DBQ measures of driving errors and non-aggressive traffic violations (i.e., speeding) but did not account for their children’s lapses in driving behaviour or aggressive driving violations (i.e., road-rage related behaviour). Unlike previous findings, parents’ histories of crash involvement and the number of tickets issued for traffic offences were not significantly associated with those of their children.

Other research has shown that parenting styles per se and the involvement of parents in the management of the child’s early driving experiences can impact on the driving outcomes of the child. In the first of these studies (Hartos, Eitel, Haynie & Simons-Morton, 2001), three hundred US drivers aged 16-18 years and licensed from one to 24 months were interviewed about their driving behaviours (crashes, risking driving behaviours, traffic offences) and potential predictive factors such as parenting styles; parental restrictions around driving; parental control; the acceptance of deviant behaviours; the behaviour of peers, and sensation seeking and self-control. To summarise the findings, lower levels of parental monitoring and control and lenient restrictions around driving were associated with a higher frequency of risk driving behaviours (e.g., speeding, following too closely, late running of traffic control lights), traffic offences, and crashes. Particularly noteworthy was the finding that lenient restrictions around the novice driver’s carriage of peer passengers was associated with a seven-fold increase in the risk of a crash and four-fold increase in the risk of incurring a traffic violation. Still in the US, a survey by Beck, Shattuck and Raleigh (2001) of parents and young novice drivers found that the children of

parents who enforced restrictions around their child's unsupervised access to a vehicle were significantly less likely to report speeding and non-use of a seat belt. Less strong evidence was reported for an association between the absence of vehicle access restrictions and aggressive driving by the young driver, self-reports of being distracted by peer passengers, and driving at high risk times such as night-time. The preceding findings were strongest for young male drivers with less than six months driving experience. This is a noteworthy qualification of the effect of parental involvement and suggests opportunities for countermeasures given that the risk of crash involvement is highest in the first six months of driving and greater for males than females.

This brief review has highlighted the capacity of parents to influence the driving behaviour and safety of their children, either by the display of their own driving behaviours or through the monitoring of and concern for their children's behaviour, particularly in relation to the early period of driving. Unfortunately there were no similar Australian or Western Australian studies to compare these findings with, which highlights the potential to investigate the role that parenting styles per se and parental driving histories may have on novice driver behaviour in jurisdictions that have already imposed significant restrictions on novice drivers to reduce their exposure to high risk scenarios.

4.3 Interventions for young drivers

Of the various interventions that have been introduced to reduce the frequency and severity of crashes and risky behaviours among young drivers, particularly young novice drivers, the three most common are driver education and training; involving parents in the supervision and management of their children's driving, and graduated driver licensing. These initiatives are briefly reviewed in the following sections.

4.3.1 Driver education and training

Driver education and training of one form or another is a requirement for driver licensure in nearly all jurisdictions around the world. Indeed, driving is a complex behaviour requiring the effective integration of perceptual, cognitive, and psychomotor skills. Driver education provides invaluable knowledge on driving rules, and in some jurisdictions, limited on-road training (Mayhew & Simpson, 2002). Driver education, however, does not seem to reduce risk of a young driver

getting into a crash. Earlier systematic reviews of school-based programs driver education programs found no evidence to support a reduction in crash involvement (Roberts & Kwan, 2001; Vernick et al., 1999) or traffic violations (Vernick et al., 1999) for program participants.

In early 2002, a group of international experts held a conference in the US (Young Driver Expert Conference) to discuss, in part, the effectiveness of various young driver crash interventions. This conference led to the publishing of a series of articles based on the conference discussions. One of the papers from this conference concluded that “the international literature provides little support for the hypothesis that formal driver instruction is an effective safety measure” (Mayhew & Simpson, 2002, p. ii3). The authors provided five possible reasons why formal driver education does not reduce young driver crash risk:

- Driver education fails to teach the knowledge and skills that are critical for safe driving;
- Driver education does teach safety skills, but students have no motivation to use them;
- Driver education fosters overconfidence in young drivers;
- Driver education fails to adequately address the role that lifestyle plays in crashes; and,
- Driver education fails to tailor content to students’ needs.

Further to the above, the review of research on driver training programs undertaken by Christie (2001) concluded that programs at the pre-licensing, novice and experienced driver level contribute little to a reduction in crashes and traffic offences for participating drivers. Despite these conclusions, there is reason to believe that “..there are some programs, or elements thereof, which have been shown to contribute to crash reductions or improved driver behaviour” (Christie & Harrison, 2003, p. 3). The authors propose that driver training and driver education programs should address higher order skills and competencies, provide drivers with a greater understanding of the limitations of their skill level, and provide insight into the risks associated with their behaviour and the personal motivations that underpin them.

A 2006 review of driver education and driver training program in Western Australia (Palamara, 2006) identified two formal programs for pre-learners relevant to the

current project. The first of these, the *Keys for Life* program, is administered by the School Drug Education and Road Aware (SDERA) office (Department of Education WA <http://www.det.wa.edu.au/sdera/detcms/navigation/road-safety/keys-for-life/>) and is delivered in secondary schools and other educational setting across Western Australia by trained teachers. The aims of the *Keys for Life* program are to increase knowledge of risky driving and safe driving behaviours; to promote positive attitudes toward safe driving among pre-learners drivers aged 15-20 years, and the importance of obtaining supervised driving experience prior to licensure. The *Keys for Life* program (as well as other SDERA programs concerned with alcohol and other drugs) emphasises resilience training as a key to developing the necessary social and emotional skills to make better decisions in relation to risk taking behaviours on the road and elsewhere. In support of this approach, there is emerging evidence of the effectiveness of programs that build resilience to reduce risk taking and crash involvement for young novice drivers (Senserrick et al., 2009).

A 2009 implementation/process evaluation of the *Keys for Life* program by Quantum Consulting (2009) concluded that it was “..an effective vehicle for delivering road safety education in the school context and developing positive road-user attitudes and behaviours amongst students” (page 11). This conclusion was based on the responses from n=111 students to statements about the impact of the program on their attitude to road safety and risky behaviours and their intention to engage in supervised driving behaviours. However, an earlier review of the short term impact of the *Keys for Life* program conducted by Palamara (2007) found that prior to undertaking the program the n=1,505 students surveyed mostly held strong positive attitudes towards a number of key road safety issues such as drink driving, speeding, and seat belt use. There was however, some evidence post-course of a shift toward more *positive* attitudes and *less* positive attitudes in other areas relative to pre-course measures. To date no research has been undertaken to determine the impact of the *Keys for Life* program on objective novice driver outcomes such as traffic offences or crash involvement.

The second local program identified by Palamara (2006b) relevant to the current project is a community based in-class and on-road driver education and training program. The Youth Driver Development program (http://www.bhrpapalia.com/html/s02_article/article_view.asp?art_id=119&nav_cat

[id=136&nav_top_id=63](#)) has operated since 1998 and up until recently received financial support from the State Government of Western Australia. Fee-paying participants are drawn mostly from secondary schools in the South-West of Western Australia. An evaluation by Palamara & Meuleners (2009) of an earlier version of the program which aimed to improve the attitudes and safe driving practices of pre-learner and learner drivers found no evidence to suggest that participants to the course were less likely to crash or to incur a traffic infringement notice or conviction in the first 12 months of driving compared with non-participants. The program has been revised since this evaluation and is now aimed at both learner and provisional drivers. It is yet to be evaluated.

In general, formal driver training and education programs – school based or otherwise - are less favourably viewed as a means to reduce risk taking and crashes among young drivers. Indeed school based driver education has been particularly identified as an unsatisfactory ‘stand-alone’ measure to reduce novice driver crash involvement (see Turcotte, Kinney, Joshi & Pike, 2006). Rather, road safety experts such as Christie & Harrison (2003) favour driver licensing systems as the key to the development of ‘safer’ drivers through the promotion of and emphasis on the need for greater levels of supervised driving prior to licensure and controls on the exposure of young novice drivers to known risk factors in the initial period of licensure. This point was succinctly made by the US Committee on Injury, Violence, and Poison Prevention and Committee on Adolescence (2006) who concluded in their summary review of driver education and training that “...experience, not training, is the key to becoming a safer driver.” (p. 2574).

4.3.2 **Parental involvement in the training and management of learner and novice drivers**

In the US and in other countries, parents are usually involved in teaching their children how to drive, and in many jurisdictions supervised practice driving is required as part of the licensure process. While most researchers agree that some level of parent supervised practice is beneficial, there is little agreement on the safety benefits of extended supervision. Some studies have found decreased post-licensure crash rates for novice drivers in association with supervised driving (see e.g., Gregersen, Nyberg, & Berg, 2003; Sagberg & Gregersen, 2005), while others such as Simon-Morton & Ouimet (2006) consider the research is inconclusive as to whether

increasing the time that parents supervise teens learning to drive improves safety. These researchers cite other studies that have failed to show benefits of extended parental supervision (see e.g., McCartt, et al. 2003; Page, Ouimet, & Cuny, 2004) and limitations of the positive studies such as a lack of true randomization of study participants. Simons-Morton & Ouimet (2006) suggest that the lack of a clear safety benefit likely results from the fact that teens need to learn how to drive safely by practicing independent driving, which does not happen while a parent is riding as a passenger. The authors point out that ideally teens should practice independent driving under the safest conditions. One way to get teens to practice under the safest conditions, without the parent in the car, is for the parent to place restrictions on their teen driver (parental management). Simons-Morton & Ouimet (2006) reviewed a number of studies on parental management and found that there is good evidence that such programs can lead to several positive safety outcomes.

Of particular note is the Checkpoints Program that is designed to increase the restrictions parents place on teen independent driving (see Simons-Morton, Ouimet, & Catalano, 2008 for a review). This program includes an informational video, an informational newsletter, and a Parent-Teen Driving Agreement that lays out restrictions on agreed upon driving behaviours. The Checkpoints Program has been evaluated in a number of randomized control trials (see e.g., Simons-Morton, Hartos, Leaf, & Preusser, 2005, 2006a, b). The Checkpoints Program has been shown to have a number of safety-related benefits including reduction of risky teen driving and traffic violations. The effect of the Checkpoints program on teen driver crashes has only been investigated using self-report and this has shown mixed results. Investigation of this program with larger sample sizes and police-reported crash data would be beneficial.

Locally, the aforementioned *Keys for Life* program is particularly concerned with promoting the involvement of parents in the learning to drive process. In conjunction with the Royal Automobile Club WA, workshops are provided for parents of program participants to promote the importance of increased hours of supervision and how to achieve this (Dunstall, Faletti, Martinovich, 2011). At this point in time there has been no formal investigation of the impact of the *Keys for Life* program on hours of supervision completed by participant learner-drivers. However, feedback from parents attending the workshops in 2010/2011 indicates that nearly all parent

respondents understood the benefits of supervised practice, with just under 88% feeling confident to supervise as a result of attending the workshop and 70% intending to provide around 100-120 hours of supervision (Dunstall et al., 2011). This is an encouraging finding but requires further research to determine whether the stated intentions of supervising drivers readily translate to practice.

4.3.3 **Graduated Driver Licensing**

Like parental management programs, graduated driver licensing (GDL) is based on the idea that novice teen drivers need to practice independent driving under the safest conditions possible. GDL programs are typically phased so that teen drivers' exposure to known crash risk factors is managed as they gain more independent driving experience and skill. These programs are particularly widespread in the USA, Canada, New Zealand and in all Australian jurisdictions, though they do vary across and within countries in content and timing. Typically GDL programs begin with a learner-permit phase where supervised driving is required; an intermediate phase where independent, solo driving is allowed but is restricted (such as no late-night driving; zero Blood Alcohol Concentration; peer passenger restrictions); and a full licensure phase where no restrictions are placed on the driver (McKnight & Peck, 2002).

There is very good evidence that GDL programs implemented in various American states is effective in reducing the crash risk of young drivers. For example, an analysis of the effectiveness of GDL in Michigan, USA found a 25% reduction in crash risk for 16 year old drivers during the first two years of the program (Shope, Molnar, Elliott, & Waller, 2001). A recent meta-analysis of the effectiveness of GDL in the US and Canada found strong support that GDL reduces crash risk for drivers aged 16 to 18 (Vanlaar, et al. 2009). Of interest to many traffic safety professionals is which components of GDL are most effective in reducing teen crash risk. Two recent syntheses of the literature (McKnight & Peck, 2002; Williams, 2007) agree that certain components of GDL seem to be particularly important in reducing teen crash risk, being: night-time restrictions; making full licensure dependent upon a clean driving record; and restrictions on passengers.

Western Australia introduced a more extensive graduated licensing program in 2002. Even after a number of amendments and revisions over the intervening years, it does

not include a number of the components thought to be most effective in reducing novice driver crashes. For example, it does not currently include passenger restrictions at any point during the Provisional period, nor are novices required to maintain an offence or crash free period of licensure to graduate from restrictions in the Provisional phase to unrestricted full licensure. Western Australian novices are not however, permitted to drive between midnight and 5.00am during the first six months of licensure. This restriction is consistent with that operating in many jurisdictions in the USA, though a number do commence the night time restriction as early as 9.00pm and finish as late as 6.00am (Insurance Institute for Highway Safety, <http://www.iihs.org/laws/GraduatedLicenseCompare.aspx>, 2012). To date, no research has been undertaken to determine the impact of WA's GDL program on the traffic offences and crashes of graduates from the various versions of the program.

Victoria is the only Australian jurisdiction to have completed an evaluation of their GDL program. The interim findings include a reported 23% reduction in casualty crash in the first year of licensure and a 31% reduction in first year serious injury crashes (Cavallo, 2012). It has been estimated that the program has resulted in road crash and injury savings in the vicinity of \$40 million per annum due to (Cavallo, 2012). The noted early success of Victoria's GDL program provides some evidence to suggest that a more comprehensive and extended package of initiatives can lead to considerable reductions in novice driver injuries and cost savings in the Australian context. Unfortunately the findings from Victoria provide little insight into the potential effectiveness of Western Australia's program as it is substantially different. For example, Victorian drivers are:

- Licensed at 18 years of age compared with 17 years of age in Western Australia;
- Required to complete 120 hours of supervised driving over a two year learner period compared with 25-50 hours in Western Australia over one year;
- Not permitted to use a mobile phone or carry peer passengers during the Provisional Phase 1 period;
- Subject to a zero Blood Alcohol Concentration Level for four years compared with two years in Western Australia;

- Required to complete an on-road exit test from Learner to Provisional Phase 1 licensure, and;
- Must have a good driving record to graduate from Provisional Phase 1 to 2 and from Phase 2 to full licensure.

In conclusion, graduated driver licensing programs have been shown to be mostly effective in reducing novice driver crashes and injuries. What is particularly encouraging about these programs to lesser and greater degrees is that they are wholly consistent with a developmental perspective that supports the management of youth risk taking by creating a safer, less challenging and less risky environment until the individual matures (biologically and psychosocially) and increases their skill level. In this way, graduated licensing programs allow novice drivers to ‘age out’ many of their developmental vulnerabilities for risk and injury (Johnson & Jones, 2011). Despite this positive assessment, graduated licensing programs can be further improved if parents are provided with a very good understanding of the developmental risks associated with driving to secure their input to supervised driving (where required) and enforcement of the provisions of graduated licensing restrictions (Johnson & Jones, 2011).

5. ALCOHOL

Alcohol is widely regarded as the most commonly used substance among young people (Roberts et al., 2001) and is a major contributor to preventable illness and death among this age group. Risky alcohol use is estimated to account for 31.5% of all deaths among men aged 15-29 in the developed world and 86% of the 3.6 million substance related deaths of both male and female 15-29 year olds worldwide (Toumbourou et al., 2007). In 2000, alcohol use was responsible for 7.8% of the global burden of disease (as estimated by disability-adjusted life years), for people aged 15-29, with males (13.1%) and developed countries (18.5%) accounting for a disproportionate amount of this burden. In the US, it is estimated that 1,717 college students aged 18-24 died from alcohol-related unintentional injury in 2001, translating into a rate of 19.3 deaths per 100,000 students. In the same year, more than 600,000 were injured because of drinking and 696,000 were assaulted by another drinking student (Hingson, Heeren, Winter & Wechsler, 2005). In addition to unintentional injuries, risky drinking such as binge drinking (i.e., drinking five or more drinks in a row) has been found to be associated with alcohol poisoning, suicide, hypertension, pancreatitis, sexually transmitted diseases, meningitis, and other disorders (Courtney & Polich, 2009).

Excessive alcohol consumption is similarly a major risk factor for morbidity and mortality among young people in Australia (AIHW, 2006). Alcohol is responsible for over 3,000 deaths and 72,000 hospitalizations each year in Australia (Chikritzhs et al. 2003). Among Australians aged 15-24 years in Australia whose death was attributed to alcohol, the rate was higher for males than females; higher for Indigenous than non-Indigenous, and higher for those living in non-metropolitan areas than metropolitan Perth (Chikritzhs & Pascal, 2004).

High intake of alcohol can severely impair brain function and can cause coma or death. The short-term effects of alcohol include a lowering of inhibitions, general euphoria, impaired cognitive and emotional processes, thus leading to an increased propensity for risk taking behaviour. Alcohol impairment and use has been linked with an increased risk of physical and sexual assault, falls, suicide, and self-harm (ABS, 2008). Indeed road injury, suicide and violence have previously been identified as the leading causes of alcohol attributed death among young Australians (Chikritzhs & Pascal, 2004). Alcohol use has also been found to be associated with

other health risk behaviours such as the use of cigarettes and illicit drugs (US Department of Health and Human Services, 2011); the practice of risky, unsafe sexual behaviours such as the failure to use condoms, and an increased incidence of sexually transmissible diseases (Newbury-Birch et al., 2009).

In Western Australia in 2005, approximately 12,000 persons were admitted for alcohol-caused acute and chronic conditions, representing approximately 1.6% and 0.75% respectively of all male and female hospital admissions. Persons aged 15-24 years accounted for the highest proportion of all admissions due to alcohol across males (4.9%) and females (1.8%) (Xiao, Rowe, Someford, Draper & Martin, 2008). With respect to deaths, in 2005 persons aged 15-24 years accounted for around 15% of alcohol-caused deaths among those aged 15-64 years (Xiao et al. 2008).

The problems associated with alcohol in Western Australia for males and young adults are particularly evident when hospitalisations and fatalities due to alcohol related injuries are considered. For the period 2000-2007, both the population rate of hospitalisation and death were highest among males and showed a clear trend of increasing sharply in adolescence (15-19 years) for both males and females and peaking at 20-24 years of age (Ballestas, Xiao, McEvoy & Someford, 2011).

5.1 **Prevalence of alcohol consumption and its association with demographic, sociocultural, and individual difference factors**

In the US, the national Youth Risk Behaviour Survey (YRBS) has been conducted for many years to monitor health risk behaviours among high school age students in grades 9 through 12 throughout the country. Results from the 2007 survey indicate that 75% reported having at least one drink of alcohol on at least one day during their life, 44.7% reported having at least one drink on at least one day during the 30 days prior to the survey, and 26% reported having five or more drinks in a row within a couple of hours on at least one day during the 30 days prior to the survey (Centers for Disease Control and Prevention, 2008a, b).

Simons-Morton et al. (2009) recently examined trends in alcohol use prevalence and “drunkenness” (i.e., asking students if they ever had so much alcohol that they were really drunk) from 1998-2006 among 15-year-olds in 24 countries and regions, including the US. They used data from the Health Behaviour in School-Aged Children Survey conducted in each country in 1998, 2002, and 2006. Trends varied

considerably by country. In 2006, the proportion of respondents reporting that they used alcohol at least monthly ranged from less than 30% in four countries to over 50% in seven countries. Drunkenness ranged from less than 20% in three countries, to over 40% in seven countries. The proportion of all respondents reporting at least monthly alcohol use across all countries declined from 45.3% to 43.6% and drunkenness declined from 37.2% to 34.8%, with considerable variability across countries with increases in some countries and decreases in others.

In another comparison of worldwide drinking, Smart and Ogborne (2000) reviewed high school alcohol use surveys among students aged 13-17. Comparable data on high school students were found for 18 countries. Wide variation in drinking patterns across countries was evident. Reported drinking six or more times within the past month ranged from 4% to 28%, drinking five or more drinks on any day in the past month ranged from 14% to 61%, drinking in the last year from 51% to 94%, and drunk at least once per month from 1% to 58%. The authors also looked at per capita alcohol consumption. Results suggested that countries could be clustered with respect to student drinking habits and per capita alcohol consumption. Countries where relatively few students drank regularly had low per capita alcohol consumption, but where per capita consumption was high, frequent drinking among students was more common. However, heavy drinking (defined in the study as five or more drinks on any day) was common in both cases.

O'Malley & Johnston (2002) examined alcohol use among college students in the US by comparing results of five surveys: Harvard School of Public Health College Alcohol Study (CAS), Core Institute (CORE), Monitoring the Future (MTF), National College Health Risk Behaviour Survey (NCHRBS), and National Household Survey on Drug Abuse (NHSDA). Results were notably similar across surveys, with about 40% of college students reporting binge drinking (five or more drinks in a row) and 70% reporting having had a drink in the past 30 days. The authors concluded that despite some improvement between 1980 and 1999, colleges need to do more to reduce heavy alcohol use among college students.

Risky drinking behaviour among older adolescents and adults in the US has also been examined, using data from the Behavioural Risk Factor Surveillance System (BRFSS; Naimi et al. 2003). The BRFSS is a series of state-based telephone surveys

coordinated by the Centers for Disease Control and Prevention (in conjunction with state health departments) for adults age 18 and older in the US, with sample sizes ranging from 102,263 in 1993 to 212,510 in 2001. Rates of binge drinking were highest among those aged 18-26. Overall, 47% of binge drinking episodes occurred among otherwise moderate drinkers (i.e., non-heavy drinkers) and 73% of all binge drinkers were moderate drinkers. In 2001, young adults aged 21-25 and underage drinkers age 18-20 had the highest rates of binge drinking episodes (18.0 episodes/person/year and 15.3 episodes/person/year, respectively), and the largest increase (56%) in binge drinking between 1993 and 2001.

International research also shows that patterns of alcohol use and abuse differ by gender. Wilsnack, Wilsnack, Kristjanson and Vogeltanz-Holm (2009) examined data from large general-population surveys of drinking behaviour in 35 countries conducted between 1997 and 2007 using the same standardized questionnaire (25 countries) or questionnaires with comparable items. Overall drinking and high volume drinking were consistently more prevalent among males than females, although the exact ratios varied. For example, O'Malley & Johnston (2002) found alcohol use to be higher among male than female college-age students. Similarly, Naimi et al. (2003) found that the rates of binge drinking among those who consumed alcohol in 2001 were more than twice as high for males aged 18-20 and 21-25 (39.0 and 38.7) than for females of the same age (17.6 and 12.5). Results from the HBSC Survey (Simons-Morton et al. 2009) add further evidence of gender effects, with males having higher prevalence rates of drinking and drunkenness than females in each survey year. However, the authors noted that the gender gap may be shrinking, as evidenced by the fact that male/female differences declined between 1998 and 2006 (41.2% versus 33.4% in 1998 and 36.7% versus 31.9% in 2006).

Trends in the consumption of alcohol and related harm for the Australian States and territories from 1990 to 2001 were investigated by Chikritzhs et al. (2003). The authors distinguished between acute and chronic alcohol-related conditions, with the former being those conditions that generally result from episodes of drinking to intoxication (e.g., assault, road injury, drowning) and the latter being those conditions that tend to develop over many years of alcohol misuse (e.g., oropharyngeal cancer, chronic gastritis). Among their key findings for younger age Australians were:

- 85% of total consumption by females aged 14-17 and 18-24 was at a risky or high risk level for acute harm (i.e. episodes of drinking to intoxication), as was 80% of total consumption by males aged 14-17;
- A striking increase was observed in the proportion of girls aged 14-17 drinking at risky or high risk levels for chronic harm (i.e., an average of more than two drinks per day); a rise from 1% in 1998 to 9% in 2001;
- Males aged 18-24 were less likely to drink at risky or high risk levels dropping from 9% in 1998 to 6% in 2001.

More recently, data on the prevalence of alcohol use in Australia were collected through the 2007 National Drug Strategy Household Survey, the ninth in a series of surveys begun in 1985 (AIHW, 2008). In the 2007 survey, 25,000 Australians aged 12 and older were asked about their knowledge of and attitudes toward drugs and alcohol, and their use of alcohol and drugs. The data showed that the weekly consumption of alcohol increased from 21% of persons aged 14-19 years to 47.8% for persons aged 20-29, 47.5% for persons aged 30-39 and 46.8% for persons aged 40-49 years. The proportion of weekly drinkers decreased from age 50+ years. Within the age groups 14-19 and 20-29 years, a slightly greater proportion of males (23%; 55.7%) than females (18.8%; 39.6%) were weekly drinkers.

In Western Australia, Crouchley, Daly & Molster's (2006) analysis of Health and Wellbeing Surveillance System data 2002-2005 for persons aged 16-24 years found that 30% of females and nearly 22% of males were non-drinkers. Of those that consumed alcohol, 21% of females and 23.4% of males consumed alcohol at risky to high risk levels for short term risk (i.e., amount of alcohol consumed on a usual drinking day that can result in behavioural problems, interpersonal violence and increased risk of collisions, falls and injury). In contrast, 5% of females and 7% of males reportedly consumed alcohol at risky to high risk levels for long term harm (e.g., amount of alcohol consumed over a usual week that can result in chronic illnesses related to the liver, digestive system and brain and cardiovascular disease).

When levels of drinking and health risk were analysed by age and gender (see Table 5.1), both sexes and older and younger age groups showed higher prevalence of risky to high risk drinking resulting in short term harm rather than long term harm, with

older age young adults shower slightly higher prevalence of drinking leading to both short and longer term harm.

Table 5.1 Percent of Western Australian young men and women by age group at risk of short and long term harm

	Women		Men	
	16-19 years	20-24 years	16-19 years	20-24 years
Drinks at risky or high risk levels for short-term harm	20.9	22.2	23.4	26.9
Drinks at risky or high risk levels for long-term harm	5.1	6.6	4.9	9.8

Source: Crouchley, Daly & Molster (2006)

Most recently, Hepworth et al. (2011) reported that 76% of Western Australian youth and young adults aged 18-30 years claimed to drink alcohol one or more days a week, with over a third claiming to consume five or more standard drinks in a session, which is higher than the recommended number to be consumed in any one drinking session. Respondents aged 18-21 years were somewhat more likely than those aged 22-25 and 26-30 years to consume 5-6 drinks (20% versus 17% and 17%) and 9-10 drinks in any one session (8% versus 5% and 4%). Overall, a greater number of young females than young males consumed up to six drinks in any one session, though young males were up to three times more likely to consume nine or more drinks. Further to this, non-metropolitan respondents were up to three times more likely to consume nine to ten drinks in any one drinking session.

Racial/ethnic differences in drinking prevalence have also been found. For example, O'Malley & Johnston (2002) reported that White students in the US had the highest rates, Black students the lowest and Hispanic in-between. Few studies have focused on Asian groups. Lum, Corliss, Mays, Cochran, and Lui (2009) examined differences among ethnic subgroups of Asian college students in the US in drinking behaviour. Their sample included 752 male and female undergraduate students between the ages of 18 and 27 who self-identified as Chinese, Filipino, Korean, or Vietnamese. Korean and Filipino students reported higher levels of alcohol consumption than the other groups. Being born in the US was a significant predictor of higher levels of alcohol consumption for females but not males.

The investigation of ethnic or racial differences for the use of alcohol in Western Australia shows that Indigenous youth display a pattern of early and excessive use that gives cause for concern. A survey of over n=1,000 Indigenous youth aged 12-17 years (Zubrick et al., 2005; Blair et al., 2005) showed that around 27% of youth drank alcohol, with 61% of males and 43% of females aged 17 years consuming alcohol. Zubrick et al. (2005) noted age and gender effects for the use of alcohol, with use and excessive use increasing with age (irrespective of gender) and males more likely than females to consume alcohol at age 17 years: 61% versus 43%. Just under five in 10 youth who reportedly drank alcohol also claimed to have drunk excessively (i.e., to the point of vomiting) in the 6 months preceding the survey. Alcohol consumption was noted to peak between the ages of 15-16 years, with the pattern of excessive use (nearly 50% of drinkers) being similar to that found among non-Indigenous youth (Blair et al, 2005). Geographic location was also found to influence use of alcohol. Those living in high or extreme isolation areas relative to those living in less isolated areas were more likely to initiate drinking and excessive drinking at an older age, and were less likely to drink and to drink to excessively (Zubrick et al., 2005).

Socioeconomic status (SES) has been widely studied as an influence on alcohol use. Hanson & Chen (2007) reviewed 28 studies, 13 of which were considered "high quality" and conducted from 1970 to 2007. Overall, the majority of studies (57%) found no relationship between SES and alcohol use during adolescence (unlike the patterns reported in adult populations). Of the studies that did find an association, the direction was not consistent. The authors suggested that alcohol use among adolescents may be more strongly influenced by peer social status than family social status.

The only Western Australian information that could be found on the frequency of alcohol consumption among adolescents of varying SES was provided by the investigation of a cohort of 17 year old novice drivers licensed in the mid 1990's (Palamara et al., 1999). The unpublished findings from this study found no statistically significant relationship between the self-reported frequency of alcohol use (never, monthly, fortnightly, weekly, more than once a week) and a measure of social disadvantage for the driver. Approximately 6% of drivers ranked 'least

disadvantaged’ reported drinking more than once per week compared with 4% of drivers ranked ‘most disadvantaged’.

While there may be mixed evidence of a relationship between socioeconomic status and alcohol consumption among adolescents and young adults, other evidence shows that increased use of alcohol by parents and peers is significantly related to an increased risk of use of alcohol among adolescents (Li et al., 2002). A systematic review by Newbury-Birch et al. (2009) of the reviews of research into alcohol and young people concluded that parents and family are generally responsible for the introduction of young people to alcohol through supervised drinking at home at an early age (e.g., prior to age 16). Reasonable evidence was also found to indicate that the age of introduction is predictive of continued use and frequency of use of alcohol by young people but not necessarily with problems with use. There is however, stronger evidence that adults/parents problem drinking is associated with problem drinking and other substance use and abuse among their children (Newbury-Birch et al., 2009). An additional finding from the Li et al (2002) longitudinal investigation of US high school students was that the effect of peer use of alcohol was diminished when parents were non-users of alcohol. This finding highlights the influence of parents in moderating the use of alcohol by adolescents even when their peers use alcohol and offer alcohol for use.

The initiation, maintenance, and extent of alcohol use by young people are complex and multi-faceted behaviours (McBride, Midford, & Farrington, 2000). Consequently, exploring how social settings and opportunities influence the consumption of alcohol by youth is also an important issue in understanding the role of alcohol in the lives of young people, the health risks this presents, and possible initiatives to counter alcohol abuse and harm. A number of social and environmental factors appear to influence alcohol use among young adults and are highlighted and summarised below. As an exhaustive review of these factors is beyond the scope of this report, a more in-depth discussion - specifically within the context of Australian society - can be found in Roche et al. (2007).

Social factors appear to play a critical role in alcohol use among young people. Social norms – our perceptions about what is “normal” behaviour among those close to us – have been found to be a powerful influence on behaviour (Berkowitz, 2005),

with the study of social norms being well established in the social sciences (Moreira, Smith, & Foxcroft, 2009). With regard to drinking behaviour, there is evidence that college students often misperceive their peer norms by overestimating the alcohol use of peers; such misperceptions, in turn, lead to increased alcohol use (Perkins, 2007).

Kuntsche, Knibbe, Gmel & Engels (2005) found that most young people report drinking for social motives (e.g., positive social use of alcohol such as camaraderie, as well as negative social motives such as drinking to fit in with peer group, not to feel left out, or peer pressure) and that such motives appear to be associated with moderate alcohol use. Similarly, Baer (2002) found social processes to be especially important for drinking in many college venues and he concluded that these processes may contribute to individual differences in drinking more than enduring personality differences.

Roche et al. (2007) conducted a comprehensive review of the literature on social and cultural factors that potentially influence alcohol use by young Australians aged 14-24. They identified a number of social trends thought to impact the social and cultural world of young people and influence their drinking behaviour that relate to major shifts in the structure of the family, roles of women, the labour market, and education. They concluded that although the family (parents and siblings) continues to play an important role in young people's alcohol use, the picture has become increasingly complex. In particular, young people's relationships with their peers have become more important as an influence on their behaviour. This is due in part to the fact that many of the changes occurring in Australian society have effectively redefined the "youth" experience so that opportunities for leisure have increased along with greater involvement with peer groups.

Social factors also play a part in the drinking behaviour of young West Australians. A recent study by Grace, Moore & Northcote (2009) set out to explore how social interactions influenced drinking behaviour amongst 18-25 year olds attending nightclubs, hotels, outdoor music events and private parties in Perth, Western Australia. The study recruited peer researchers who were trained in observational methods and who reported (with consent) their friends' drinking and partying behaviours. A record was made of the venues attended and their characteristics, the

number and type of drinks consumed the activities and significant events that occurred and the transport methods used. A total of 123 field reports were produced across eight distinct social networks. Seventy participants drawn from a wide variety of ethnic backgrounds, including university students, employed professionals, white-collar workers and tradespeople, were studied. Further to this, in-depth interviews with 31 participants complemented the observation data, focusing on past and current drinking patterns, motivations for drinking and the social meanings constructed through drinking practices and related activities. Stake holder interviews with venue managers, policy makers and staff from alcohol and other drug agencies were also conducted.

While alcohol consumption was found to be central to social interactions across all eight networks, there was considerable variability in the quantity of alcohol consumed, the use of drugs other than alcohol, and involvement in arguments or fights. The authors also acknowledged the negative physical effects of alcohol and other drug consumption. Young adults were aware of the risks of harmful situations associated with heavy drinking, evidenced through the well-developed strategies to minimise some of the risks, particularly amongst young women. These strategies included:

- Planning transport, having a designated driver or using public transport;
- Actively preventing, trying to prevent, and chastising friends for drink driving;
- Avoiding venues with violent reputations, and choosing venues where staff and patrons are relaxed and friendly;
- Staying with, and looking after, friends and partners, including avoiding and refusing arguments and fights amongst friends, other patrons and/or security staff;
- Eating before drinking and later in the night;
- Drinking water between alcoholic drinks, and;
- If taking drugs, taking care in procuring them, and understanding their effects (e.g., dehydration) and the risks associated when combining them with alcohol.

In general, alcohol was perceived by participants to be integral to their social lives; the consumption levels were considered by the participant group to be ‘normal’,

acceptable and pleasurable, though the quantity consumed was greater than the amounts recommended in current healthcare campaigns.

In a social context, drinking games appear to be an important part of the broader culture among young Australians which considers binge drinking normal and enjoyable. A mix of quantitative and qualitative methods research by Polizzotto et al. (2007) of the participation by Western Australian university students aged 18-25 years in 'drinking games' concluded that such games promoted high levels and rates of alcohol consumption and drinking binges. Participation in drinking games was found to be regular and common; almost 75% of students had played a drinking game at some time in the past. The most popular beverage was beer (77%) while the most common setting was a private home (65%). Significant amounts of alcohol were consumed during games, the average consumption during the course of a game being seven standard drinks for men and five standard drinks for women ($t = 3.66$, $p < 0.01$). More than half the players ($n = 190$) reported adverse outcomes, including losing consciousness (32%), needing time off from work or study (22%). Importantly, pressure from the social group to play and continue playing can be significant. Nearly 60% of those surveyed reported that they felt pressure to participate while 50% of women and 70% of men had pressured others. Although the results are generally consistent with international studies, Australian data differed in one major respect: sexually motivated coercion did not emerge as a significant theme. Polizzotto et al. (2007) called for the incorporation of the hazards of drinking games into existing harm reduction messages. Despite the limitations of this research (including respondent bias and the limited questionnaire distribution to only second-year university students), this paper usefully frames drinking games and participation within the landscape of youth alcohol consumption and binge drinking.

Until recently, few studies have focused on the broad and various environmental factors that may influence alcohol use, including economic, political, and ecological factors (Dowdall & Wechsler, 2002). In the tertiary education and broader community, factors such as drinking traditions, alcohol availability, price, advertising, outlet density, and proximity to outlet appear to be important considerations in the facilitation of drinking. Presley, Meilman & Leichter (2002) reviewed the literature on the relationship of college environments to student drinking. They identified several "institutional" variables that appear to influence

individual student alcohol use, including affiliations, presence of a fraternity/sorority system, role of athletics on campus, two or four year designation, type of residence hall, institution size, location, overall quantity of drinking on campus, the pricing and availability of alcohol, and outlet density. They concluded, however, that current research is not sufficient to determine which factors have the greatest influence on alcohol use.

The influence of alcohol advertising on young people continues to be the subject of much debate. However, evidence is growing that alcohol marketing plays a significant role in young people's decisions to drink and in how they drink (Jernigan & Mosher, 2005; Saffer, 2002). While many econometric studies (i.e., statistical examination of the relationship between overall levels of alcohol use and overall levels of advertising) have failed to find an effect, more focused consumer studies (that examine how people's drinking knowledge, attitudes, and behaviour vary with their exposure to alcohol advertising), do show clear links between advertising and behaviour (Hastings, Anderson, Cooke & Gordon, 2005). In addition, these effects do not take into account the fact that advertising is only one component of a broader marketing strategy that often includes price promotions, distribution, point of sale activity, and new product development. Taking this into account, Hastings et al., (2005) argued that the literature presents an increasingly compelling picture that alcohol marketing is having an effect on young people's drinking.

Personality and behavioural factors have also been identified to effect alcohol consumption among young people. Across all ages, a meta-analytic review of the relationship between sensation seeking and alcohol consumption conducted by Hittner & Swickert (2006) noted small to moderate correlations, with the strongest association observed for the sensation seeking sub-scale of disinhibition. With specific reference to younger age adults, in a review by Baer (2002), increased levels of drinking among college students were found to be associated with higher impulsivity and sensation scale scores (a measure of risk taking) as well as negative emotional states (e.g., stress or anxiety). These findings are consistent with other reviews of the issue. For example, Kuntsche, Knibbe, Gmel & Engels (2005) found that students who reported coping motives for drinking (e.g., to avoid or regulate unpleasant emotions) or enhancement motives (e.g., to enhance positive mood, for kicks or excitement, to get high, to feel good) were more likely to be heavy drinkers.

In addition, drinking to cope with negative emotional states was particularly associated with alcohol problems. Gonzalez, Collins & Bradizza (2009) explored the context of drinking motives and found that solitary heavy drinking (drinking while alone) was associated with depression and with higher rates of drinking problems than heavy drinking in social contexts.

5.2 **Interventions for alcohol use**

Historically, prevention efforts among college/university age students have focused on educational strategies, but mounting evidence suggests that these strategies are not effective as stand-alone measures (e.g., Walters & Bennett, 2000). For example, a recent review of the literature found that cognitive-skills based interventions and brief motivational feedback (including mailed graphic feedback) were consistently more effective in reducing levels of risky drinking among young people than informational/awareness interventions. The review also recommended that high-risk students should be targeted for such interventions either through brief screening in health care centres or through membership in an identified risk group on campus (e.g., year of enrolment, social and sporting club memberships) (Larimer & Crouse, 2002).

While the short-term effectiveness of many alcohol interventions has been frequently noted in the literature, the evidence for long-term effects is more limited (e.g., Bruvold, 1993; Tobler & Stratton, 1997). An earlier review by Skara & Sussman (2003) focused on long-term effects of nine alcohol intervention studies that followed adolescents for at least two years. Reductions in rates of weekly alcohol use ranged from 6.9% to 11.7% and persisted for up to 15 years following the intervention. Program effects were less likely to decay among studies that delivered booster programming sessions. Foxcroft, Ireland, Lowe & Breen (2002) reviewed and re-analyzed a number of longer-term evaluations (over three years of follow-up) and found one particular program, the *Strengthening Families Programme*, to offer promise. Indeed other reviews (e.g., Eisen, Pallitto, Bradner & Bolshun, 2000) have shown that interventions which incorporate a strong role for families and parents are moderately effective in delaying the use of alcohol and/or reducing alcohol consumption by school age youth.

Locally, the previously discussed SDERA program in Western Australia also administers school based programs to educate youth on the risks associated with the use of alcohol and other drugs. As with the *Keys for Life* program, these program are based on resilience training to provide students with the skills required to make informed choices about the use of alcohol and other drugs. At this stage there is no published evidence of the impact of the SDERA program on the use of alcohol and other drugs among program participants (B. Faletti, Personal Communication, September 2012).

One other locally developed and implemented school and family based program related to resilience training worth noting for its impact on the use of alcohol among youth is the *Aussie Optimism Program* (AOP) (Roberts et al., 2011). The AOP is described as a mental health promotion program addressing the development of individual social life skills and optimistic thinking and other skills involving parents and families and their relations with youth (Roberts et al., 2011). A two-year randomised AOP treatment (two conditions) versus control study involving Grade 6 students from Western Australian primary schools noted that AOP was associated with a reduced likelihood of alcohol use at post-test (end of Grade 7 year) and at 12-months (once the children were in secondary school) in one AOP condition only: AOP trained teachers who received additional coaching. No information was presented in relation to the impact of the program on males versus females. These findings provide encouraging support for the utility of programs that focus on resilience training to protect youth at a time when risk taking in relation to substance use is on the rise.

Many interventions to reduce alcohol misuse among college students use a “social norms” approach intended to correct misperceptions that students may have about the extent to which their peers actually drink. Moreira, Smith & Foxcroft (2009) conducted a systematic review of 22 controlled trials involving 7,275 college or university students randomly assigned to a social norms or control group. As described by the authors, the social norms interventions typically involved either social marketing (using universal, mass communications methods for educating students with regard to drinking behaviours) or personalized normative feedback to provide students with information about actual student drinking norms.

Findings indicated that interventions delivered via the web or computer, or in individual face-to-face sessions, appeared to reduce alcohol misuse. The evidence was less convincing for group face-to-face sessions, and outcomes for mailed and group feedback were essentially no different than for the control intervention. Overall, significant effects were more apparent for short-term outcomes (up to three months).

While the majority of current efforts to reduce alcohol use have focused on individual and group programs (targeting knowledge, attitudes, and behavioural intentions), many would argue that more comprehensive interventions that include prominent environmental components are more likely to have significant impact (Boyd & Faden, 2002). To this end, several environmental strategies to reduce college drinking have been promoted including: i) increasing compliance with underage drinking laws by decreasing social and commercial access to alcohol; ii) reducing consumption and risky alcohol use by placing restrictions on where and how alcohol is sold and distributed, how much alcohol costs, and where it is consumed; iii) decreasing specific types of alcohol-related problems, such as traffic crashes, by creating youth-specific blood alcohol content (BAC) laws; and iv) de-emphasizing the role of alcohol on campus by promoting academics and citizenship (Toomey & Wagenaar, 2002). Toomey & Wagenaar (2002) point to a body of studies using robust research designs that indicate that reducing alcohol availability through policy changes can reduce alcohol use and related problems among young people. Indeed regulatory interventions around issues such as age of access, price, availability and terms of use were cited by Toumbourou et al. (2007) as strong and effective measures toward reducing consumption and harm among adolescents.

6. SMOKING

Tobacco use is a significant health problem around the world and has been identified as the leading modifiable behaviour contributing to mortality in the US (Mokdad, Marks, Stroup, & Gerberding, 2004) and elsewhere. In Australia, smoking is one of the leading preventable causes of premature death and chronic disease. It is associated with a high risk of cardiovascular disease, respiratory illness, pregnancy complications and ulcers (AIHW, 2007). It is estimated that smoking related diseases account for around 15,000 deaths annually (Scollo & Winstanley, 2008) with the vast majority of these deaths occurring in late adulthood (65+ years) (ABS, 2006).

Smoking is generally initiated in adolescence and is often the first drug used by young people (AIHW, 2007). Findings from several studies in the US, Australia and New Zealand suggest that tobacco use by adolescents may predict a range of social and health problems in early adulthood (Mathers, Toumbourou, Catalano, Williams, & Patton, 2006) and possible later illicit drug use (AIHW, 2007). For these reasons smoking is a significant health risk behaviour among young adults.

6.1 **Prevalence of smoking and its association with demographic, sociocultural, and individual difference factors**

Given the early-age onset of smoking, considerable efforts have been undertaken to monitor the prevalence of smoking among adolescents. One of the most comprehensive efforts is the Global Youth Tobacco Survey (GYTS), a world-wide collaborative surveillance initiative led by the World Health Organization (WHO), the US Centers for Disease Control and Prevention, and the Canadian Public Health Association (The Global Youth Tobacco Survey Collaborative Group, 2002). The GYTS is a self-administered school-based questionnaire most recently conducted in 132 countries and the Gaza Strip/West Bank region among adolescents aged 13-15. Findings for the period 1999 to 2005 indicate that nearly two of every 10 students reported currently using any form of tobacco (17.3%), with reported use highest in American and European regions and lowest in the South-East Asian and Western Pacific regions (Centers for Disease Control and Prevention, 2006a). There were no statistically significant differences between the proportion of students reporting cigarette smoking (8.9%) or other tobacco use (11.2%). Males were more likely than females to report currently using any tobacco products in Eastern Mediterranean, South-East Asian, and Western Pacific regions. Males were significantly more likely

than females to report smoking cigarettes in the African, South-East Asian, and Western Pacific regions. The report concluded that use of tobacco by adolescents is a major public health problem in all six WHO regions.

Another survey of adolescent smoking in ten European countries and Canada (Hublet, De Bacquer, Valimaa, Godeau, Schmid, Rahav, & Maes, 2006) also raised concerns about adolescent smoking trends and their implications for public health. Findings from a school-based survey among 14-15 year-olds conducted from 1990 to 2002 indicated that the prevalence of daily smoking among males in 2002 ranged from 5.5% in Sweden to 20.0% in Latvia. Among females, the daily smoking prevalence in 2002 ranged from 8.9% in Poland to 24.7% in Austria. Based on the full survey period, the authors identified three groups of European countries in different stages of the smoking epidemic curve: countries with a declining or stagnant trend, countries with an increasing trend followed by a decreasing trend, and countries with an increasing trend.

Recent trends among high school students in the US appear more promising. Results from the Monitoring the Future study, which has been surveying national samples of students in 8th, 10th, and 12th grade since 1991 (about 45,000 students in 400 schools each year) indicate that smoking rates in 2008 were at the lowest level since the early 1990s (Johnston, O'Malley, Bachman, & Schulenberg, 2009a; University of Michigan News Service, 2008). Across the three grades combined, monthly smoking prevalence declined from 13.6% in 2007 to 12.6% in 2008, with the declines greatest in the upper grades.

Despite these encouraging trends, smoking remains a public health issue in the US. Findings from the Youth Risk Behaviour Survey, a nationwide survey of students in grades 9-12, found that in 2007, 50.3% of students in grades 8-12 had tried cigarette smoking, with 20.0% of students reporting smoking cigarettes on at least one day in the past 30 days (Centers for Disease Control and Prevention, 2008d). In addition, the prevalence of smoking among young adults aged 18-25 has been estimated at 40.8% and among adults age 26 and older at 25.2% in the US (Substance Abuse and Mental Health Services Administration, 2003).

Australian trends in the prevalence of smoking have recently been summarized by Scollo & Winstanley (2008) using data from several national surveys. Smoking prevalence has declined among both sexes in all age groups since 1980. Up until 2004, the proportion of smokers aged 18-24 had been very similar to those 25-29, but by 2007, the 18-24 age group had rates lower than any other age group except those aged 60 and over. Despite these improvements, 19% of those aged 18-24 currently smoke. Western Australia has also noted that the prevalence of smoking among teenagers and young adults is widening. For the period 2002-2005, on average, 21% of Western Australians aged 20-24 years reported they were current smokers compared with an average of 13% of those aged 16-19 years (Couchley et al., 2006). Fortunately, smoking prevalence among Australian secondary students (aged 12-17) has followed the same trend as older Australians, declining during the 1980s, levelling off in the early 90s, and then falling again between 1998 and 2005.

Historically, the prevalence of smoking has been higher among males than females. Whilst the report cited above on smoking in six WHO member countries noted that the prevalence of smoking was greater among males than females, several other studies suggest that rates may be converging at least in North America, with equal or higher levels of smoking reported by females in countries with Western cultural orientation (e.g., Substance Abuse and Mental Health Services Administration, 2003; Tyas & Pederson, 1998; Warren, Jones, Erickson, & Asma, 2006). The prevalence of smoking among males and females in Australia also appears to be converging. Scollo & Winstanley (2008) reported that young males and females aged 18-24 now share similar patterns of smoking, compared with the higher rates among males than females observed in the 1980s. This convergence can be traced to increased initiation of smoking among young females and at the same time, decreasing rates of regular smoking among young males. Patterns are similar for secondary students in Australia, with relatively equal proportions of males and females smoking at each year of age except among 16-year olds; in this age group, females are more likely to report regular smoking (Scollo & Winstanley, 2008). Likewise, Western Australian data for the period 2002-2005 (see Table 6.1) shows that across the age groups 16-19 years and 20-24 years, males (12.7% and 22.4%) and females (13.3% and 19.6%) report a similar prevalence of daily smoking (Couchley et al., 2006).

Table 6.1 Percent of young Western Australian women and men by smoking status and age group; by age group, 2002-2005.

	Women		Men	
	16-19 years	20-24 years	16-19 years	20-24 years
Smokes	13.3	19.6	12.7	22.4
Previously smoked	6.5	13.5	3.1	11.1
Has never smoked	80.1	66.9	84.1	66.5

Source: Couchley, Daly & Molster, 2006

Differences in smoking prevalence have also been found by race/ethnicity (Hoffman, Sussman, Unger, & Valente, 2006). Among adult racial/ethnic groups in the US, Asians and Hispanics had a significantly lower prevalence of smoking than American Indians/Alaskan Natives, non-Hispanic Blacks, and non-Hispanic Whites (Centers for Disease Control and Prevention, 2007). Similarly, US surveys of students in grades 9-12 indicate that overall prevalence of lifetime daily cigarette use and current use is higher among White than Black and Hispanic students (Centers for Disease Control and Prevention, 2008e). In Australia, smoking prevalence among the Aboriginal and Torres Strait Islander populations is almost double that of the Australian population as a whole, with about half of the combined Aboriginal and Torres Strait Islander populations smoking on a daily basis. Approximately 50% of Indigenous aged 18-24 years surveyed in 2004-2005 claimed to smoke on a daily basis (Scollo & Winstanley, 2008). With respect to Western Australia, Scollo & Winstanley (2008) reported data from 2000-2002 to show that 12% of 12 year old Indigenous smoked regularly (i.e., daily for at least a month) rising steadily to 58% of those aged 17 years. Interestingly, other data cited by Scollo & Winstanley (2008) showed that the prevalence of smoking for WA Indigenous aged 12-17 not attending school is approximately twice that of those who are still in school.

Socioeconomic status (SES) is also associated with smoking status among young adults. There is evidence that higher parental SES is inversely related to smoking status of adolescents in Australia and elsewhere, with disadvantaged groups being more likely to begin and continue smoking once initiated (Scollo & Winstanley, 2008; Tyas & Pederson, 1998). Further, personal income of adolescents themselves has been found to be positively related to smoking, presumably because it provides spending money that can be used to buy cigarettes (Tyas & Pederson, 1998). An SES related variable, education, has also been found to influence smoking, with higher

levels of education associated with a decreased likelihood of smoking (Scollo & Winstanley, 2008). As with alcohol, no reliable Western Australian information could be found on the association between smoking and SES among Western Australian youth. Unpublished findings from the investigation by Palamara et al. (1999) of a cohort of 17 year old novice drivers found no statistically significant association between self-reported frequency of smoking and a measure of social disadvantage.

With respect to region of residence, an earlier review by the Australian Department of Health and Ageing (2005) found little information on differences in the prevalence of smoking among Australian youth by region of residence. The Western Australian and Victorian studies reviewed by the Department found few differences in the prevalence of smoking among urban and rural adolescents (Department of Health and Ageing, 2005). The authors commented however, that the sociodemographics of the residential area, rather than its geographic location per se, is likely to influence adolescent and young adult smoking behaviour if the neighbourhood is populated by groups who have a higher prevalence of smoking (e.g., lower SES groups; Indigenous).

Parent and peer influence on adolescent smoking has been widely studied. Hoffman, Sussman, Under & Valente (2006) reviewed this literature and found peer influence to consistently emerge as a significant predictor of adolescent smoking in studies in the US, Australia, New Zealand, and elsewhere. Other reviews have found peer smoking, as well as affiliation with peers who engage in high levels of other problem behaviours and self-identification with a high-risk social group, to predict the onset of adolescent smoking (e.g., Baker, Brandon, & Chassin, 2004; Li et al., 2002). It appears that perceived smoking by peers is more important than actual smoking (Peters, et al., 2009). Further research is needed to better understand the mechanism through which this influence occurs. While parental smoking also appears to influence adolescent smoking initiation (e.g., Li et al., 2002), study results are less consistent and show weaker effects in overall magnitude than for peer smoking (Baker, Brandon, & Chassin, 2004). However, stricter parental norms and rules for adolescents were found to have a protective effect against smoking in at least one review (Peters, et al., 2009).

While environmental factors associated with smoking have been less often studied than individual and social factors, there is some evidence that access to cigarettes contributes to the initiation of smoking. Affordability appears to play an important role in access. Based on a review of several studies, Chaloupka & Pacula (2001) concluded that smoking by young people is relatively more responsive to price than smoking by older people. They estimate that youth are up to three times more sensitive to price than adults, with a 10% price increase estimated to reduce youth smoking prevalence by 5% or more. However, some young people may be able to overcome the problems of availability and affordability by using unbranded, untaxed loose tobacco, known as “chop-chop” (Scollo & Winstanley, 2008). Another environmental influence on smoking among young people is advertising. A comprehensive review of studies on tobacco advertising concluded that tobacco advertising and promotional activities are important catalysts in the smoking initiation process (Biener & Siegel, 2001). The authors suggested that tobacco advertisements may be particularly attractive to adolescents who, for one reason or another, are searching for an identity that the images are carefully designed to offer. The relevance of the above social and environment circumstances to the smoking status of Western Australian youth is largely unknown since no studies or reports on these factors for WA youth could be identified for review.

A number of studies have linked adolescent smoking to intrapersonal characteristics such as temperament, personality, and psychopathology, including peer self-control, rebelliousness, sensation seeking, impulsivity, and low self-esteem (Baker, Brandon, & Chassin, 2004; Scollo & Winstanley, 2008; Urbán, 2010). In addition, a strong link between negative affect and smoking has been found, with pre-existing depressive symptoms possibly setting the stage for smoking initiation which may then further exacerbate depression (Baker, Brandon, & Chassin, 2004). Other conditions associated with psychopathology that may influence smoking include disruptive behaviour disorders (e.g., oppositional defiance disorder, conduct disorder, and attention-deficit/hyperactivity disorder), anxiety, and other substance abuse disorders (Scollo & Winstanley, 2008). Whilst no published information could be found relating personality or temperament to smoking among WA youth, unpublished findings from the investigation of n=1,796 17 year old drivers licensed across metropolitan Perth and rural WA, 1995-1997, noted a statistically significant

relationship between smoking and scores on a measure of impulsivity and sensation seeking (risk taking): 21% of 17 year olds who ranked high on impulsivity and sensation seeking were smokers, compared with 10.6% of those ranked low (Stevenson & Palamara, 2001).

6.2 **Smoking and the risk of crashing**

There is minimal evidence of a direct association between smoking status and involvement in a crash for young drivers. Hutchens et al. (2008) sought to identify risk factor profiles of young drivers involved in crashes in the US. After duly controlling for possible confounders, they found that apart from length of licensure, the two factors with the strongest crash association were driving alone while drowsy and being a current smoker. Current smokers were more than twice as likely to have had a crash compared to non-smokers (although self-reported use of other alcohol and marijuana had no association). The authors explicitly conjectured (amongst other possible explanations) that “people who risk their health by engaging in smoking may also be more risk-tasking drivers; for example, smokers have been found to wear their safety belts less often” (Hutchens et al., 2008, p. 874).

6.3 **Interventions for smoking**

Sussman, Sun & Dent (2006) conducted the first meta-analysis of teen cigarette smoking cessation studies, which combined results from 48 studies. Their work builds on five earlier systematic reviews of the literature on teen smoking cessation (Backinger, Fagan, Matthews, & Grana, 2003; Garrison, Christakis, Ebel, Wiehe & Rivara, 2003; McDonald, Colwell, Backinger, Husten, & Maule, 2003; Sussman, Lichtman, Ritt, & Pallonen, 1999; Sussman, 2002). Sussman et al. (2006) defined “teen cigarette smoking cessation programming” as any type of programming in any setting that targeted young people aged 12-19, focused on individuals who smoked at baseline, and encouraged them to quit smoking.

The studies included in the meta-analysis represented five types of theoretical content: social influence; cognitive behavioural; motivational enhancement; medical; and other. As described by Sussman et al. (2006), social influence-oriented programs are intended to combat social influences that serve to promote or maintain smoking, by providing refusal assertion skill instruction, instruction in awareness of tobacco industry promotions, discussion of media and peer social influences, and correction

of social informational inaccuracies, as well as advocacy techniques. Cognitive-behavioural programs provide instruction in cognitive-behavioural self-monitoring and coping skills to quit and maintain cessation through smoking diaries and strategies for coping with stress (e.g., seeking out social support, relaxation, problem solving). Motivational enhancement programs include techniques to clarify individuals' desire for change and reduce ambivalence to that change through the use of such strategies as motivational interviewing (in which individuals are given feedback and empathy using a non-judgmental approach), response-contingent reinforcement, and stages of change techniques. Medical programs employ strategies to ease the physical effects of withdrawal through medication or focus on recovery from addiction. The fifth type of program includes theoretical content that does not fit within the other four categories, such as an emphasis on restricting access to cigarettes through supply reduction (e.g., through price increases or restricted access) or techniques to clarify and remove conflicted affect to facilitate smoking cessation.

Results of the meta-analysis indicated that across studies, program conditions compared to control conditions appeared to give smokers a 2.90% (1.47-4.35) absolute advantage in quitting, increasing the probability of quitting smoking by 46% (9.14% versus 6.24%). Consistent with previous reviews, the authors found that cognitive-behavioural and motivation-theory-related programs had relatively higher quit rates; unlike previous reviews, social influences programs also had relatively higher rates. The authors noted that it was unclear whether interventions that combine all three types of programming would be superior or whether different programming might be relatively effective with different youths (e.g., at different durations of lifetime smoking). They also found that classroom based programs were relatively effective, although they lacked a sufficient number of studies to evaluate the effectiveness of computer-based modalities. Program effectiveness was positively related to the number of sessions; there was no apparent incremental effect beyond five sessions. While the authors called for more teen smoking cessation research, they concluded that teen smoking cessation programs can be effective.

In an update of their earlier work, Sussman & Sun (2009) reviewed 64 teen tobacco use cessation studies, focusing on program content, modalities of delivery, number of contacts, and expected quit rates at follow-up. Of the 64 studies, 47 were completed in the US, four in Australia, three in Canada, two in New Zealand, and the rest

elsewhere. Results from the review yielded slightly higher outcomes than the previous analysis, although the effect size was still not large (overall absolute risk reduction of 4.26%, increasing the probability of quitting smoking by 57%). Consistent with the earlier findings, effects were notable for social influences, cognitive-behavioural, and motivation enhancement programming. Relatively high quit rates were found for programs with at least five sessions. Effects were maintained at short-term (one year or less) and longer-term follow-ups, as in 2006. The authors also examined the use of electronic communication to assist in teen smoking cessation but again, they lacked sufficient studies to reach meaningful conclusions. Similarly, they found only one study examining the effects of cigarette pricing on smoking cessation, although results suggested that a 10% increase in the real price of cigarettes would increase the probability of smoking cessation among young adults by approximately 3.5%. Based on their findings, the authors recommended that youth cessation programs: be delivered in a context structured for youth (e.g., school, sports club, health clinic); consist of at least five lessons; be as fun as possible including games, dramatizations, and use of alternative medicine concepts; emphasize cognitive-behavioural, motivation-theory related, and some social influences content.

While efforts to facilitate smoking cessation are clearly important, it is also critical to try to prevent adolescents from experimenting with cigarettes in the first place. In fact, the reduction in smoking prevalence over the past 10 years identified in the Monitoring the Future Study has been attributed in great part to the fact that fewer students try cigarettes in the first place; thus it is critical to prevent smoking very early (Johnston, O'Malley, Bachman, & Schulenberg, 2009). Developmental prevention programs exemplify the type of initiatives to reduce and disrupt pathways to drug-related harm such as from smoking, by intervening very early in the child's life to provide optimal conditions for healthy, substance free development through adolescence (Toumbourou et al., 2007). For example, Toumbourou et al. (2007) reported that interventions that aim to alter the norms and consequences of tobacco use within families show promising signs of reducing the incidence of smoking among adolescents. However, these programs must be conducted over many years and must adopt a multi-strategy approach to combat the delayed burden of harm associated with smoking.

Two recent reviews focused on the long-term effects of adolescent smoking prevention programs (Skara & Sussman, 2003; Wiehe, Garrison, Christakis, Ebel, & Rivara, 2005). Skara & Sussman (2003) examined 25 long-term tobacco and drug use prevention studies that followed adolescents for at least two years. Most of the programs reported statistically significant program effects for smoking outcomes, indicating reductions in the percentage of baseline non-users who initiated smoking in experimental versus control conditions ranging from 9-14.2% and lasting for up to 15 years. Program effects were less likely to decay among studies that delivered booster programming sessions. Results from Wiehe et al. (2005) were not so promising. They examined only studies of school-based, randomized, controlled trials of smoking prevention with follow-up evaluation to aged 18 or 12th grade and at least one year after the intervention ended. Eight of 177 studies met the selection criteria; only one of the eight showed a decreased smoking prevalence in the intervention group. Similarly, the highest quality and longest trial (the *Hutchinson Smoking Prevention Project*) examined in a systematic review by Thomas & Perera (2006) found no long-term effects from 65 lessons over eight years.

In Western Australia, only one recently published systematic study of the impact of a school based program on smoking among youth was identified. The aforementioned (see Section 5.2) investigation by Robert et al. (2011) of the impact of the *Aussie Optimism Program* delivered to Grade 6 and 7 students in government primary schools found that students who received the program delivered by AOP trained teachers with additional coaching were significantly less likely to be smokers than control students 12-months following the program (when the students were transitioning to high school), as was also the case for alcohol. The impact of this program on both alcohol and smoking provides encouraging support for the potential effect of resilience training on illicit drug use among Western Australian youth. This could be evaluated through a longer term follow-up study of the student participants into later adolescence.

The broad array of school-based programs has emerged largely because schools provide an efficient mechanism for reaching large numbers of young people. At the same time, the decision to begin or continue smoking is made within a broad social context, and is influenced by a broad range of factors - thus, community interventions to influence adolescent smoking have also been developed that use a

coordinated, multi-component approach (Sowden & Stead, 2003). Such programs might include age restrictions on tobacco purchase and mass media efforts, as well as school programs. A systematic review of community-based trials by Sowden and Stead (2003) found some evidence that coordinated, multi-component programs can reduce smoking among young people and that they do so more effectively than single strategies alone.

One component of community interventions that has received increasing individual attention in the US and elsewhere in recent years is mass media – that is, using anti-smoking advertising to reduce smoking prevalence among young people. A recent review of studies of this approach found that anti-smoking advertising appeared to have more reliable positive effects on those in pre-adolescence or early adolescence by preventing the start of smoking (Wakefield, Flay, Nichter, & Giovano, 2003). The authors concluded that the effectiveness of anti-smoking advertising can be influenced by a variety of individual, social, and environmental factors, and that there is no single “recipe” for anti-smoking advertising that leads to reductions in youth smoking. Similarly, an earlier systematic review of mass media interventions found some evidence that they can be effective in preventing the initiation of smoking by young people, but that overall, the evidence is not strong (with two of six interventions reviewed found to be associated with reductions in smoking (Sowden, 1998).

Recent advances in communication technology provide opportunities to reach young people in new ways, not only to provide anti-smoking messages, but also to deliver other prevention and cessation strategies. More recently, Walters, Wright & Shegog (2006) examined 19 studies of computer and internet-based interventions for preventing or reducing smoking, and found mixed results, with nine studies (47%) reporting statistically significant or improved outcomes at follow-up compared to a comparison group. Few patterns emerged, although the format of computer-generated feedback reports was most consistently associated with improved outcomes. Further research in this area is needed.

7. ILLICIT SUBSTANCE USE AND ABUSE

Illicit substance use and abuse is a major concern for all countries for at least three reasons. First, use of illicit substances, by definition, is a criminal behaviour. Second, abuse of illicit substances can cause significant health problems. According to a report published by the Australian Government Department of Health and Ageing (Loxley et al., 2004), illicit drug use can lead to a number of problems with physical and mental health including: contraction of blood-borne disease; cancers; stroke; heart disease; depression; psychosis; and cognitive deficits. Finally, illicit substance use and abuse has been linked to many other youth problem behaviours such as self-harm, suicide, violent crime, and unsafe sexual practices (Loxley et al., 2004) as discussed in other sections of this report.

In this section, we describe the prevalence of, factors related to, and countermeasures for reducing the use and abuse of illicit substances. Because alcohol and tobacco use for youth is illegal in many countries, these too can be considered illicit. Use of these substances has been addressed in earlier sections of this report.

7.1 **Prevalence of illicit drug use and abuse and its association with demographic, sociocultural and individual difference factors**

The University of Michigan in the US has been conducting an annual survey of illicit substance use among youth, including prevalence, perceived risk, disapproval, and availability of a number of illicit substances since 1975 (see e.g., Johnston, O'Malley, Bachman, & Schulenberg, 2009a). This survey, titled *Monitoring the Future*, encompasses responses from more than 46,000 8th, 10th, and 12th grade students from more than 400 schools in the US. Data from this survey provide a comprehensive estimate of the prevalence of illicit drug use in the US. Table 7.1 shows the 2008 annual prevalence of illicit drug use (percent of respondents who reported using the drug in the past 12 months) by three grades and sex. Note that use of illicit drugs tends to increase with age, but this trend is not evident for all types of illicit drugs. For some drugs such as heroin and crack, use remains stable throughout the three grades. This table also shows that illicit drug use among youth in the US is only slightly more common for males than for females, with the difference for the use of any illicit drug only one to two percentage points higher for males in all three grades. The most commonly used illicit substance is inhalants, closely followed by marijuana.

Table 7.2 shows similar prevalence data for Australian youth. The data for this table are from a nationwide survey of secondary schools with youth (aged 14-19 years). As can be seen, about 30% of young Australians have used an illicit drug in the past 12 months, with little difference between males and females. This prevalence of illicit drug use by young Australians is slightly less than that of young Americans (34-38%) and young Canadians, who have an annual prevalence of about 33% for 15-19 years olds (Tjepkema, 2004). By far the most commonly used illicit substance by young Australians is marijuana, similar to the US.

Table 7.1 Proportion of youth using illicit drugs; by drug type, school grade, sex; USA 2008

Drug	Males			Females		
	8 th Grade %	10 th Grade %	12 th Grade %	8 th Grade %	10 th Grade %	12 th Grade %
Any illicit drug	14.3	27.9	38.8	13.7	25.6	34.1
Marijuana	12.2	25.5	35.1	9.5	22.2	29.5
Inhalants [#]	7.0	5.4	4.4	11.0	6.3	3.2
Hallucinogen	2.2	4.7	7.8	2.0	3.1	3.9
LSD	1.4	2.2	3.7	1.2	1.3	1.6
Ecstasy (MDMA)	1.4	3.4	5.5	2.0	2.4	3.3
Cocaine	1.8	3.0	5.2	1.8	2.8	3.5
Crack	1.0	1.3	1.7	1.2	1.2	1.3
Heroin	0.9	1.0	1.0	0.7	0.6	0.4
Heroin w/ needle	0.6	0.6	0.6	0.4	0.4	0.6
Heroin w/out needle	0.6	0.8	0.7	0.6	0.4	0.3
Narcotics not heroin	na	na	10.6	na	na	7.9
OxyContin	2.3	3.8	5.3	1.8	3.5	4.0
Amphetamine	3.5	5.8	6.5	5.5	6.9	6.8
Ritalin	1.5	3.0	3.7	1.5	2.9	2.9
Methamphetamine	0.9	1.4	1.4	1.5	1.6	0.7
Tranquilizer	1.7	4.1	6.8	3.2	5.0	5.7
OTC cough/cold	2.7	4.9	6.3	4.3	5.7	4.7
Rohypnol (“roofie”)	0.6	0.3	1.5	0.3	0.6	0.8

Source: Johnston, O’Malley, Bachman & Schulenberg (2009a) #Defined as any gas or fume inhaled for the purposes of getting high, which includes many household products

Table 7.2 Proportion of youth aged 14-19 years using illicit drugs; by drug type and sex, Australia 2002

Drug	Male %	Female %
Any illicit drug	28.8	26.6
Marijuana	26.6	22.6
Ecstasy (MDMA)	5.7	4.3
Injecting drugs	0.6	0.6
Heroin	0.4	0.4
Heroin w/ needle	0.4	0.4
Amphetamine	5.7	6.8

Source: Loxley et al. (2004)

A slightly later (2004) survey of drug use in Australia for a broader age range of youth and young adults noted that the rates of illicit drug use increased with age, rising from 8% for 12-15 year olds to 26% for 16-19 year olds and to 33% for 20-24 year olds. Marijuana was the most common illicit drug used by young people (5% of 12-15 year olds, 22% of 16-19 year olds and 27% of 20-24 year olds). Methamphetamine use was negligible in the 12-15 year old population, but 6% of 16-19 year olds and 11% of 20-24 year olds reported using it (AIHW, 2007).

Relative to the national proportions, illicit substance use by young Western Australians is comparatively lower. Survey data (2002-2005) provided by the Health Department of WA (Table 7.3) show that marijuana is the most frequently used illicit drug for both males and females, followed by amphetamines and ecstasy. Use of these substances appears to increase with age and is greater among older young males compared with older young females, particularly in regard to amphetamine and ecstasy use.

Table 7.3 Proportion of males and females aged 16-24 years using illicit drugs; by drug type and age group, Western Australia, 2002-2005.

	Women		Men	
	16-19 years %	20-24 years %	16-19 years %	20-24 years %
Marijuana	6.7	11.6	13.1	15.7
Amphetamines	4.3	5.6	5.7	12.0
Ecstasy	1.8	4.1	4.3	11.4

Source: Couchley et al. (2006)

As with other substance use and abuse, the evidence suggests that WA young Indigenous persons are more likely to use marijuana relative to use among the population reported in Table 7.3. Blair et al. (2005) report that 41% of Indigenous youth aged 15-16 years had tried (as opposed to currently used) marijuana and that use of the drug was associated with poor school performance and parental use of 'drugs'. A considerably higher prevalence of cannabis use (81%) was reported at an earlier time for a smaller sample of n=27 Indigenous youth aged 15-17 years residing in the Western Australian rural area of Albany (Gray, Morfitt, Ryan & Williams, 1997).

The most recent survey of Western Australian youth aged 18-30 years questioning the acceptability of smoking marijuana found that 14% considered it 'sometimes to always' acceptable to do so (Hepworth et al., 2011). Young males (19%) were more likely than young females (8%) to consider that smoking marijuana was acceptable. Females (67%) were considerably more likely than males (56%) to consider that it was 'never' acceptable to smoke marijuana as were those aged 26-30 years (66%) compared with those aged 22-25 (58%) and 18-21 years (61%). With respect to other illicit drugs, upward of eight in ten young respondents considered that it was 'never' acceptable to use substances like ecstasy (80%), cocaine (85%), Gamma Hydroxybutyrate (GHB) (88%), methamphetamines (88%), or to inhale solvents (94%). Further analysis showed that females were significantly more likely than males to consider that the use of all these substances was 'never' acceptable, suggesting that males have a greater social and health risk acceptance in regard to these illicit substances.

As was noted for the use of other drugs discussed elsewhere in this report, youth living in particular socioeconomic and residential circumstances may be at greater risk for illicit drug use. Family SES seems to play a complex role in whether or not a child begins using illicit drugs. On one hand, a cohort study in Christchurch, New Zealand found that low family SES predicted marijuana use (as well as problem alcohol use) in 15 to 16 year olds (Fergusson & Horwood, 1997). This study also found some evidence that poly-drug use in young people was predicted by factors often related to SES, such as being born to teenage parents, sole parents, and parents with a low education. On the other hand, a longitudinal cohort study in two counties of New York found that the father's level of education was positively related to

increased use of illicit drugs for young males (Kandel, Simcha-Fagan, & Davies, 1986). Similarly, a different US cohort study found that females raised in higher SES families were more likely to engage in poly-drug use in late adolescence (Brook, Whiteman, Finch, & Cohen, 1996). Based on these limited data, it appears that SES may have a two-fold influence on youth illicit drug use. The effects of low SES on many aspects of health and well-being may also influence drug use as one of the many problem behaviours that can be impacted, whereas high SES may make illicit drugs more affordable and therefore more likely to be used. The impact of SES on youth illicit drug use needs further research, particularly in relation to its identification as a risk factor for illicit drug use by Western Australian youth.

Related to the influence of SES, illicit drug use by youth is more common by those living in disadvantaged neighbourhoods. As discussed by Loxley et al. (2004), a number of literature reviews have found very high rates of youth illicit drug use in communities characterized by low SES, low income, and poor housing quality. Coincident with this finding is that the availability of illicit drugs in these communities is high.

At least one study has also suggested that low involvement in structured community activities may be a risk factor for later use of illicit drugs. The Australian Temperament Study (Williams, Sanson, Toumbourou, & Smart, 2000) found that children at age 13 to 14 years who had low involvement in sport or community activities involving adults were more likely to get involved in poly-drug use. These effects were persistent even after adjusting the analyses for potential confounding factors such as SES.

Unfortunately there is very little local information to substantiate the role that economic and social circumstances play in the use of illicit drugs by Western Australian youth. The best evidence of this nature appears to relate to the use of illicit drugs by Indigenous of all ages, including youth, who generally reside in disadvantaged economic and social circumstances.

As with the consumption of alcohol and use of tobacco, there is some evidence to suggest that illicit drug use by parents can increase the likelihood that their children will be users of illicit drugs. For example, in the Christchurch Cohort study, poly-

drug use at age 15 was associated with maternal prenatal use of drugs, tobacco, and alcohol (Fergusson & Horwood, 1997). Such findings suggest that maternal use of these substances might cause developmental problems in babies that eventually manifest in adolescent drug use problems. Other studies suggest that parents' use of illicit substances such as marijuana serve to 'model' the behaviour as acceptable for adolescents and youth. For example, a longitudinal study in Australia found that substance use, including marijuana, by both mother and father were significantly associated with higher substance use (alcohol and marijuana) among children aged 15-16 years (Williams et al., 2000; Smart & Vassallo, 2005). Similarly, Li et al. (2002) found that parents' use of marijuana significantly predicted use by high school age adolescents. Loxley et al. (2004) also noted in their review that there is strong evidence of a range of family factors as being protective against youth illicit drug use, including high attachment to the family; low parental conflict; negative family attitude toward drug use; and high parental communication and monitoring. With respect to this last finding, Martins et al. (2008) also found that low parental monitoring of a child's behaviour (i.e., not being aware of or involved in the child's behaviour) was significantly associated with the use of ecstasy and marijuana by US adolescents aged 12-18 years.

As previous noted, peers play an important role in adolescent development. This process seems to extend to the experimentation with illicit drug use as there is good evidence that use of illicit drugs by young persons' peers is a risk factor for their own use of illegal substances. For example, a cohort study in Victoria, Australia followed 2,032 students from 44 secondary schools for more than three years (Coffey, Lynskey, Wolfe, & Patton, 2000). The study collected self-reported data on use of marijuana, as well as alcohol and tobacco. This study found that the perceived use of marijuana by peers and fellow class mates was associated with the predicted prevalence of marijuana use by 15 year olds, and daily use of marijuana by 16 to 17 year old males. These effects were found even after adjusting for a number of factors related to youth drug use. This finding is supported by the reporting of a significant relationship between friends' and high school age adolescents' use of marijuana (Li et al., 2002) and peer drug use and personal use of ecstasy among a national sample of youth aged 12-18 in the USA (Martins et al., 2008). Around 86% of the sample that used ecstasy had friends who were also users of illicit drugs. Unfortunately no

published information could be found to support the influence of parental drug use, family dynamics and parenting styles and peer drug use on the use of illicit drugs by young Western Australians.

A range of behavioural and personality factors have been associated with illicit drug use among youth. The results of some studies suggest that overly aggressive children are more likely in the future to engage in illicit drug use. For example, the Australian Temperament cohort study found that children, who were rated by their teachers as more aggressive at ages 11 and 12, were more likely to be engaging in illicit drug use at ages 15-16 than those children who were rated low in aggression (Williams et al., 2000). Similarly, a cohort study in New York found that children whose mother's rated them as aggressive at age eight were more likely to be poly-drug users at age 14 (Brook, Whiteman, Finch, & Cohen, 1996).

Personality traits such as sensation seeking have also been associated with illicit substance use. A US national survey of youth aged 12-18 years found that high sensation seeking adolescents were significantly more likely to be users of ecstasy and marijuana (Martin et al., 2008). In Australia, the Australian Temperament Study observed that higher scores on sensation seeking (a measure of the disposition to engage in risk taking behaviour) was significantly associated with higher levels of substance use, including marijuana, at 15-16 years of age (Smart & Vassallo, 2005). Most recently, unpublished findings from the survey of n=19,880 newly licensed drivers aged 17-24 years in New South Wales found that 24% of the cohort ranked as high sensation seekers reported using marijuana less than monthly or more frequently, compared with 5% of participants ranked as low sensation seekers (H. Y. Chen, personal communication, 2011).

Unfortunately no published literature could be found for the personality and behavioural correlates of illicit drug use among Western Australian youth.

7.2 Interventions to reduce the use of illicit drug use by youth

Interventions to reduce the use of and harm associated with illicit drug use are best categorised as primary, secondary and tertiary. As Toumbourou et al. (2007) explain, primary prevention refers to those strategies that aim to prevent initial use of illicit substances. In contrast, secondary prevention is concerned with minimising the harm

associated with the substance in the early period of use, while tertiary prevention aims to treat the longer term issues associated with use. Primary prevention programs that are ‘zero tolerance’ in their approach are reported by Toumbourou et al. (2007) to be ineffectual, while secondary prevention programs that promote total abstinence are likely to fail program participants who are unwilling to reduce use altogether. What is thus required is a co-ordinated suite of interventions that range from regulatory (e.g., using measures to interrupt supply and demand) to harm reduction (e.g., measures that acknowledge use will continue but try to limit the associated harm, as in needle exchange programs and safe injecting facilities). In respect to interventions for adolescents, Toumbourou et al. (2007) concluded in their systematic review of interventions, that *regulatory* (i.e., establishing universal laws and enforcement), *developmental prevention* (i.e., establishing universal optimal conditions for healthy child and adolescent development) and *early screening and brief intervention* (i.e., use of motivational initiatives to reduce high risk use) are most effective for dealing with the use of illicit substances by adolescents.

Notwithstanding these above findings, the following intervention programs are summarised to highlight the processes that could be adapted for use to counter risk taking among young drivers.

7.2.1 **School-Based Programs**

Most schools provide some level of a drug use prevention program. A review of the effectiveness of such a wide array of programs cannot be covered here. However, based on an extensive literature review, Paglia & Room (1999) developed recommendations for best practice about the structure, content, and delivery of school-based programs for the prevention of illicit drug use by youth (Paglia & Room, 1999).

The structure of programs should be as follows:

- The program should be long term and intensive, starting as early as kindergarten and continuing through high school.
- Different approaches should be used for different sub-groups of students.
- Involve students in the development of the curriculum and implementation.

The content of the program should be as follows:

- Do not use knowledge-only and affective-only content, as this type of content is ineffective.
- Include content on motivation for drug use and skills for attaining the same outcomes without use of drugs (focus on and practice skill building).
- Content should be factual and non-contradictory.
- Content should include discussion of actual normative behaviour.
- Content should focus on developing life skills behaviours.

The delivery of the program should be as follows:

- Atmosphere should be tolerant and supportive, with no use of scare or fear tactics.
- Program should emphasize active learning, such as role playing and group discussions.
- Leader should be trusted by the students (peers can be effective).
- Content taught in the course should be reinforced by community, including parents and policies.

7.2.2 **Mass Media**

Mass media as an intervention against drug use is attractive because of its ability to reach a large audience and has been utilized extensively in this way. Indeed, teens report learning about drugs primarily through the television (e.g., Mirzaee, Kingery, Pruitt, Heuberger, & Hurley, 1991). Unfortunately, mass media campaigns are difficult to properly evaluate and, therefore, no such evaluations have been completed for programs targeting illicit drug use. Some research has found that mass media campaigns, especially those in combination with an educational program, have lowered the tobacco use among teens. Based on these studies, Paglia & Room (1999) present recommendations on how mass media might help prevent use of illicit drugs:

- Use multiple media outlets.
- Combine campaign with other prevention efforts.
- Use media to stimulate discussions.
- Have content be entertaining and promote a healthy lifestyle.
- Base content on the audience.
- Avoid fear or scare tactics.

- Use a credible non-celebrity spokesperson.
- Present factual information.

7.2.3 **Sport and Recreation Programs**

Given that low community involvement is a risk factor for illicit drug use, it is not surprising that programs have been developed to get young people involved in their communities. Indeed, there is some evidence that these programs can have a modest effect on reducing use of marijuana and other illicit drugs. According to Loxley et al. (2004), studies of Boys and Girls Clubs have found low incidence of illicit drug use as compared to settings where such clubs do not exist. Such conclusions, however, should be treated with caution as there could be other factors accounting for the differences. Thus, the effectiveness of involvement in community activities in preventing drug use should be considered unknown, but promising.

8. SEX AND THE CONSEQUENCES OF UNSAFE SEXUAL BEHAVIOUR

The engagement by young people in risky sex behaviours, such as unprotected sex, can lead to adverse consequences such as unintended pregnancy and sexually transmitted infections (STIs) such as human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) (Dittus, Miller, Kotchick, & Forehand, 2004). These consequences carry high social, economic, and health costs for affected individuals, their children, and society (Centers for Disease Control and Prevention, 2009a). The rates of STIs alone underscore the need for continued attention to the sexual risk behaviour of young people and efforts to prevent and/or reduce unsafe sexual practices and the promotion of health-protecting behaviours such as the use of condoms.

Evidence from US surveys of young people aged 10-24 (Centers for Disease Control and Prevention, 2009a) indicate that many young individuals engage in sexual risk behaviour and experience negative health and reproductive health outcomes. In 2006, approximately 22,000 adolescents and young adults aged 10-24 years in 33 states were living with HIV/AIDS, and approximately one million adolescents and young adults aged 10-24 years were reported to have Chlamydia, Gonorrhoea, or Syphilis. In addition 25% of females aged 15-19 years and 45% of those aged 20-24 years had evidence of infection with human papillomavirus between 2003 and 2004. There is also evidence that recent progress in reducing unsafe sexual practices appears to be slowing or even reversing (Centers for Disease Control and Prevention, 2009a).

Compared to other high-income countries, Australia's HIV prevalence of 0.2% is relatively low. However, there has been a slow, steady increase in new HIV diagnoses in Australia and New Zealand, with the rate of recently acquired HIV infections in Australia rising by roughly 50% between 1998 and 2007 in several regions of the country, although nationwide, total cases fell modestly between 2006 and 2008 (UNAIDS, World Health Organization, 2009). Meanwhile, annual notification rates of Chlamydia and Gonorrhoea increased between 2000 and 2004, (National Centre in HIV Epidemiology and Clinical Research, 2005), with young people aged 12-24 accounting for half of the STI notifications in 2005 (AIHW, 2007).

In Western Australia, the infection notification rates for Chlamydia and Gonorrhoea provide further insight into the consequences of the practice of unprotected sex among young persons in this state. For both infections, the rates of notification in 2009 were highest among those aged 15-19 years and 20-24 years compared with the all-age notification rate (see Table 8.1).

Table 8.1 Notification rates for Chlamydia and Gonorrhoea; for selected age groups, Western Australia, 2009.

Age Group (years)	Sex	Infection Rate*	
		Chlamydia	Gonorrhoea
15-19	Male	808.9	204.7
	Female	2,377.9	240.5
	All	1,567.1	222.0
20-24	Male	1,747.0	219.3
	Female	2,422.8	220.8
	All	2,070.5	220.0
All Ages	Male	324.4	68.9
	Female	470.6	52.1
	All	394.4	60.6

Source: adapted from Department of Health, (2010). *Age-specific rate per 100,000 population.

Table 8.1 also highlights the higher incidence rate among women for the two diseases. Further investigation of the rates for Chlamydia show the risk of infection for Western Australian Indigenous youth aged 15-19 years and 20-24 years is 6.9 times and 3.4 times that for same aged non-Indigenous youth (Department of Health, 2010).

8.1 **Prevalence of sex and unsafe sexual behaviour and the association with demographic, sociocultural and individual difference factors**

Self-report surveys represent the most significant source of information on the prevalence of sex and unsafe sexual practices and provide insight of the potential risk of adverse consequences such as those described above. In the US, the national Youth Risk Behaviour Survey (YRBS) is conducted every two years and provides data representative of 9th through 12th grade students in public and private schools. Data from the 2007 survey (Centers for Disease Control and Prevention, 2008a,c) indicate that: 47.8% of students (CI=45.1-50.6) had ever had sexual intercourse; 14.9% (CI=13.4-16.5) had sexual intercourse with four or more people during their lifetime; 35.0% (CI=32.8-37.2) were currently sexually active; 61.5% (CI=59.4-63.6)

used a condom during last sexual intercourse; 16.0% (CI=14.2-17.9) used birth control pills before last sexual intercourse; and 22.5% (CI=20.7-24.5) drank alcohol or used drugs before last sexual intercourse. While rates of reported sexual activity decreased between 1991 and 2007, they showed no change from 2005. Condom use increased from 1991-2003 but showed no change from 2003 to 2007, while use of alcohol/drugs before sexual intercourse decreased from 2001 to 2007 but showed no change during the latter part of the period (2005 to 2007).

In one of the largest self-report surveys of health-related behaviour among college students in the US (71,860 students on 107 campuses), the American College Health Association (2008) found that 49.1% of students had had vaginal intercourse one or more times in the past 30 days, 45.3% oral sex, and 5.2% anal sex. Among students who had had sexual intercourse, 52.8% reported using a condom during the last time. Among those who had had oral sex, 4.5% used a condom. Of those who had anal sex, only 27.9% used a condom. A total of 15.8% reported having had unprotected sex after drinking alcohol.

With respect to Australia, over the past 40 years there has been a downward trend in the average age at first intercourse for the Australian population, from 18 to 16 years for males and 19 to 16 years among females (de Visser, 2003). A major source of Australian prevalence data has been the National Survey of Secondary Students and Sexual Health, which interviews over 2,000 students in School Years 10 and 12 from across Australia (Smith, Agius, Dyson, Mitchell, & Pitts, 2003). The survey was recently updated (Smith, Agius, Mitchell, Barrett, & Pitts, 2009) and selected findings are presented in Table 8.2. Results indicate that over one quarter of Year 10 students and over half of Year 12 students have had sexual intercourse. Almost three-quarters of each age group reported using a condom during their most recent sexual encounter, although a significant number of students reported having had sex without a condom at some time in their life. Among sexually active students, about one third of each age group reported having had sex with three or more partners in the past year.

Comparisons with the 2002 survey (the most immediate past survey; see Smith, Agius, Dyson, Mitchell, & Pitts, 2003) indicate several trends over time. There was an increase in self-reported sexual intercourse, as well as in the proportion of

students reporting having had sex with three or more people in the past year. Condom use remained stable between 2002 and 2008. Differences between Year 10 and Year 12 students, in terms of older students being more likely to engage in sexual activity, persisted. Somewhat troubling is the finding that Year 10 and Year 12 do not always use condoms and that around a quarter reported being drunk during their last sexual encounter and that one in ten students reported using the withdrawal method at their last sexual encounter (Smith et al. 2009).

Table 8.2 Self-reported sexual activity among Year 10 and Year 12 adolescents; by gender, Australia, 2008

	Year 10 Students % Reporting Activity			Year 12 Students % Reporting Activity		
	Males %	Females %	Total %	Males %	Females %	Total %
Oral Sex	32.4	34.3	33.6	48.4	63.1	58.4
Ever had sexual intercourse	27.1	27.6	27.4	44.4	61.7	56.1
Sex without a condom	14.1	18.1	16.6	30.0	46.2	41.1
Sex with a condom	26.5	28.0	27.4	45.5	60.3	55.6
Of sexually active: 3+ partners in past year	36.1	25.4	29.3	38.2	27.2	30.0
Of sexually active:						
-Always use condoms	66.1	56.0	56.5	50.7	43.7	46.8
-Sometimes use condoms	27.0	42.1	35.6	40.7	48.5	46.9
-Never use condoms	6.9	1.9	4.2	8.6	7.8	6.3
Condom used most recent sexual encounter	76.1	69.4	71.9	74.5	71.0	72.6
Drunk last time had sex	23.8	17.9	20.1	42.7	21.4	26.9

Source: Smith et al. (2009)

In Western Australia, in 2002 more than half (56%) of those surveyed aged 16-19 years and over eight in 10 aged 20-24 years reported having had sexual intercourse (Couchley et al., 2006). Other findings presented by Batini & Scerri (2009) show that nearly one in five Western Australians aged 18-30 years of age had their first sexual encounter under the age of consent (16 years). In comparison, 75% of Indigenous 17 year olds had engaged in sexual intercourse and for half of these youth their first sexual encounter had occurred before the age of consent (16 years) (Blair et al., 2005).

Data provided by Couchley et al. (2006) show that approximately around one in ten Western Australian men and women aged 16-24 years reportedly did not use any form of contraception or protection (see Table 8.3). Of concern is the finding that

nearly half of all women and one-third of men did not use condoms as a ‘safe sex’ measure.

Table 8.3 Use of contraception by type for 16-24 years old men and women; Western Australia, 2002-2005.

Type of contraception	Women %	Men %
Condoms	51.2	67.3
Contraceptive pill	67.4	45.0
No contraception	10.2	11.7
Other	9.1	1.2
Withdrawal	1.8	6.1
Rhythm method	0.0	0.4
Spermicide	0.0	0.4
Diaphragm	0.0	0.4

Source: Couchley et al. (2006)

With respect to the young Indigenous in Western Australia, the survey findings reported by Blair et al. (2005) indicate that of those who were sexually active, 70.1% relied on condoms to prevent pregnancy - a proportion found to decline with age. Despite these reported levels of condom use, nearly 34% and 22% of women aged 17 and 16 respectively, reported having been previously pregnant (Blair et al., 2005).

In another Western Australian study of sexually activity and safe sex practices (Fenwick, Skinner, Merriman, Marshall, Smith & Hallett, 2009), 42 sexually active males between the ages of 15 and 25 years were surveyed and interviewed to understand what promotes or constrains safe-sex practices. The interviews revealed three distinct patterns of behaviour. The first pattern was labelled ‘compromising nothing’, whereby young males maintain active control over condom use and thus avoid pregnancy and STI. They relied on multiple methods of birth control/sexual protection (namely the Pill and a condom) and do not engage in unprotected sex. The second pattern was titled ‘lowering the guard’. Within this pattern of behaviour, whereby interviewees put the onus of responsibility on their partner for taking the Pill and not be engaging in unprotected sex with other men. These males believed that clean STI tests were a green light to discontinue condom use with their partners. ‘Throwing caution to the wind’ was a more dismissive approach towards personal risk and condom use, resulting in engagement in unprotected sex if there was no protection available. Males with this pattern of behaviour were also more likely to engage in sex impulsively: the loss of inhibition through the consumption of alcohol

or being ‘in the moment’ providing sufficient reason for reduced personal control over condom use. A substantial number of interviewees also described being reluctant to use condoms because of reduced sexual pleasure and/or inconvenience. Further investigation is required to understand how prevalent these mind sets are in the general male youth population.

Sexual behaviour among adolescents appears to be influenced by the timing of physical development, with early maturing girls having an earlier age of onset of sex, and being physiologically more susceptible to some STIs and more likely to have older and riskier male partners (e.g., Pedlow & Carey, 2004; Peters, Wiefferink, Hoekstra, Buijs, ten dam, & Paulussen, 2009). Chronological age also plays a role in sexual behaviour. Older adolescents have been shown to report more sexual activity, have more partners, and in some studies, use condoms less consistently, at least in minority and mixed race samples (Kotchick, Shaffer, Forehand, & Miller, 2001). In addition, a lack of cognitive maturity, lack of life experience and skills, and egocentric thinking among adolescents, in general, can undermine decision making with regard to sex, although decision making ability does improve during adolescence (Pedlow & Carey, 2004).

While both young males and females engage in unsafe sexual practices, there are gender differences in their specific behaviours. For example, reviews of the literature by both Kotchick, Shaffer, Forehand & Miller (2001) and Lewis, Miguez-Burbano, & Malow (2009) found that college-age males were more likely to report use of condoms but also to have had more sex partners (Lewis et al., 2009). Among females, higher levels of condom use appear to relate to the ability to be assertive, intentions to use condoms, and avoidance of substance use, and sex with a casual rather than primary partner (Lewis et al., 2009). Research findings relative to differences by race/ethnicity are inconclusive and depend on the racial groups being compared and the risk behaviours being studied, and are often confounded by other factors such as SES, education, and access to health care (Kotchick, Shaffer, Forehand & Miller, 2001).

The influence of various beliefs and attitudes on sex and unsafe sex has also been studied. Peters, Wiefferink, Hoekstra, Buijs, ten dam & Paulussen (2009) found that initiation of sex was tied to the belief that it would lead to immediate gratification.

On the other hand, individuals who perceived the health risks associated with sex were less likely to initiate it. Knowledge about the risks associated with unsafe sex (e.g., HIV transmission) appears to have little impact on condom use (Lewis et al., 2009). There is some evidence that self-efficacy, the belief that one has the ability to perform a particular action effectively, although not studied as much as other factors, may be associated with fewer sexual partners, more condom use, and even greater resistance to pressure to engage in unwanted sex (e.g., Kotchick et al., 2001; Lewis et al., 2009; Peters et al., 2009).

A number of studies have found an association between alcohol use and unsafe sexual practices. For example, a review by Cooper (2002) found that drinking among college students was strongly related to the decision to have sex and to indiscriminate forms of risky sex (e.g., having multiple or casual sex partners) but was inconsistently related to protective behaviours such as condom use. Drinking was more strongly associated with decreased protective behaviour among younger individuals, on first intercourse experiences, and for events that occurred further in the past. The author concluded that future efforts to reduce alcohol use in potential sexual situations may decrease some unsafe sexual practices, but are less likely to affect protective behaviours directly. Gender and race differences in the relationship between drinking and unsafe sexual practices were not clear.

As with the previously discussed risk behaviours, sensation seeking has also been found to be associated with sexual behaviours including a higher number of partners among US college students (Gullette & Lyons, 2005) and infrequent condom use and multiple partners among adolescent African-American females (Spitalnick et al., 2007).

Past sexual victimization has also been identified as a possible influence on later sexual behaviour (Kotchick et al., 2001). Senn, Carey & Venable (2008) found that childhood sexual abuse (CSA) was associated with later sexual risk behaviours across a number of studies. This association was found among both males and females, adolescents and adults, and the general population and vulnerable populations (e.g., individuals who use drugs, have a mental illness or are incarcerated), as well as relatively high functioning populations such as college students. In particular, most studies found an association between CSA and sex

trading, more sex partners, and an earlier age of first intercourse. Similarly, findings from a recent meta-analysis (Arriola, Loudon, Doldren & Fortenberry, 2005) found an association between CSA and four HIV risk behaviours among females including unprotected sexual intercourse, sex trading, sex with multiple partners, and adult sexual revictimization, although effect sizes varied considerably and ranged only from small to moderate.

There is evidence that peers can influence adolescents' attitudes, values, and sexual risk behaviour. Specifically, adolescents whose peers engage in risky behaviour are more likely to initiate sexual intercourse and engage in other risky behaviours (Kotchick et al., 2001; Pedlow & Carey, 2004). At the same time, parents continue to play an important role in the sexual socialization of children and adolescents. Parenting behaviour has been identified as an important source of influence on adolescent sexual activity, both indirectly through modelling and directly through parental monitoring, parent-adolescent relationship quality, and parent-adolescent communication (Kotchick et al., 2001). Dilorio, Pluhar & Belcher (2003) conducted one of the first comprehensive reviews on parent-child communication about sexuality, including 95 studies of adolescents aged 11-18, conducted in the US (92%), Australia, Mexico, and Canada. The likelihood and quality of parent-child communication was affected by parental communication style and level of knowledge, as well as the gender of both the parent and child involved in the discussion. Findings relative to the effects of parent-child communication on delayed initiation of sexual intercourse among adolescents were inconclusive. The few studies focusing on increasing condom use and reducing partners were somewhat more promising, particularly when discussions occurred prior to first initiation of sex. More optimistic conclusions were reached by Dittus, Miller, Kotchick & Forehand (2004). They pointed to a body of literature suggesting that parents and other family members play critical roles in shaping adolescent sexual behaviour through their parenting practices, communication of expectations regarding adolescent sexual activity, and modelling of risk reduction strategies.

8.2 **Interventions for Unsafe Sexual Practices**

Most countermeasures to date have been designed to influence individual-level factors related to unsafe sexual practices such as assertiveness, communication skills, and self-efficacy; few programs have attempted to intervene within the broader

contexts in which adolescents form their attitudes, intentions, and values around sexuality (Dittus et al., 2004). In addition, many countermeasures target younger adolescents because of the opportunity to: intervene prior to the onset of sexual activity; influence peers' perceptions and norms; promote condom use at first intercourse (a predictor of future condom use); intervene at a time when female adolescents are physiologically most vulnerable to some STIs; and promote healthy sexual practices before risk behaviour becomes established and more difficult to change (Pedlow & Carey, 2004). In addition, many interventions to reduce unsafe sex practices have as their ultimate goal the reduction of HIV risk, because of the seriousness of this health risk. Several reviews of these interventions, as well as interventions targeted to older adolescents, have yielded promising but not totally unequivocal results.

A recent meta-analysis on the effects of 16 controlled HIV risk-reduction trials in the US involving sexually experienced adolescents (aged 13-19) in both school and out-of-school settings was conducted by Mullen, Ramírez, Strouse, Hedges & Sogolow (2002). The authors found a statistically significant protective effect of the interventions, both in and out of the classroom, in terms of the risk of having sex without condoms (based on 13 studies, summary odds ratio=0.66, CI=0.55-0.79). The strongest effects were associated with interventions that took place in groups comprised of a homogeneous ethnic group. The authors suggested that this finding might be an indicator of the importance of cultural fit in approaching such a sensitive topic, with discussions being more effective among adolescents with similar perspectives. The meta-analysis did not find any program effects on number of sex partners. Pedlow & Carey (2003) reviewed 23 HIV risk-reduction trials conducted in school, community, and health care settings. Intervention effects in reducing HIV risk were evaluated with one or more unsafe sexual practices including frequency of penetrative or unprotected sex, number of sexual partners, diagnosis of STIs, increased condom use or abstinence, and among sexually inexperienced youth, delay of onset of sex. Thirteen of the interventions (57%) achieved significant risk reduction effects. Collectively, across studies in which each specific outcome was measured, frequency of unprotected sex decreased in 75% of studies, condom use increased in 53% of studies, number of partners decreased in 27% of studies, and abstinence increased in only 14% of studies. The authors concluded that many

adolescent HIV risk-reduction interventions have been effective but the effect sizes are small. They also cautioned that little is known about the specific factors associated with effective interventions.

Some of these potential factors were explored in a content analysis of 24 sexual risk-reduction trials among adolescents (Pedlow & Carey, 2004). Results indicated that interventions were more effective in delaying the onset of sexual activity than in promoting abstinence among youth who were already sexually active. Interventions that included booster sessions, and/or focused on improving sexual communication, assertiveness, and negotiation skills were more effective in reducing most unsafe sexual practices. The authors concluded that interventions should take into account developmental transitions during adolescence, as they influence sexual behaviour. The focus on building skills, rather than only providing information/education, supports a large body of evidence that education alone is not sufficient to reduce unsafe sexual practices (Johnson, Carey, Marsh, Levin, & Scott-Sheldon, 2003; Kotchick et al., 2001).

A relatively new approach to reducing unsafe sexual practices is to base interventions on the Transtheoretical Model (TTM). TTM asserts that the adoption of healthy behaviours or elimination of unhealthy ones likely occurs through a series of stages of change over time and that these changes require the active use of different processes or strategies at each stage (Prochaska, Redding, Harlow, Rossi, & Velicer, 1994). Five stages are specified including: 1) precontemplation (no awareness of problem or plan to change in next six months); 2) contemplation (awareness of problem, no specific plan but intent to take action in next six months); 3) preparation (plan to take major action in next 30 days, initial steps taken); 4) action (actual behaviour change persisting for up to six months); and 5) maintenance (changed behaviour lasting for 6 or more months Prochaska, Clemente, & Norcross, 1992). Horowitz (2003) conducted a systematic review of the literature on pregnancy and STI prevention efforts based on TTM. He concluded that age, partner type, gender, reasons for engaging in safer sex behaviour, self-efficacy, sexual assertiveness, and perceived advantages and disadvantages of condom use were related to stage of change. Results with regard to the effectiveness of such interventions in reducing unsafe sexual practices were inconclusive, however, because of the wide ranging differences in methodologies and samples.

Many efforts to reduce unsafe sexual practices have focused on men who have sex with men (MSM), given the risk that this type of sex carries for HIV. Johnson et al. (2008) conducted a systematic review of interventions to reduce risk for sexual transmission of HIV among MSM that included individual counselling and/or social and behavioural support (such as peer education, assertiveness and relationship support, discussing attitudes and beliefs). They found that such behavioural interventions can lead to significant risk reduction in MSM, particularly efforts to promote personal skills (e.g., keeping condoms readily available, avoiding excess intoxicants, self-reinforcement for behaviour change, and behaviour self-management). Specifically, a 40% reduction in unprotected sex was observed among studies that addressed personal skills. At the same time, the authors called for continued research to identify more conclusively which behavioural strategies are most effective.

9. SELF HARM AND SUICIDE-RELATED PHENOMENA

The behaviours reviewed in the preceding sections represent a potential risk to the health of young people without any deliberate intent or purpose to do so. In contrast, ‘self-harm’ and other suicide related behaviours reviewed in this section are deliberately undertaken to harm oneself, with and without intent to end one’s life.

The terms used to describe these behaviours and their definitions vary. At times ‘self-harm’ is used to refer to all behaviours involving self-inflicted injury, fatal or otherwise. At other times ‘self-harm’ or ‘self-injury’ is used to refer to only those behaviours, whilst deliberate, that are not intended to end one’s life (Martin, Swannell, Harrison, Hazell & Taylor, 2010). Most recently, self-harm was operationalised as “..culturally unacceptable behaviour that involves direct and deliberate infliction of physical harm to one’s body, regardless of the presence of suicidal intent and in the absence of a pervasive developmental disorder” (Vrouva, Fonagy, Fearon & Roussov, 2010 p. 852). Further to this, the phrase “suicidal phenomena” is often used to categorize attempted suicide, intentional self-harm, and thoughts about suicide and self-harm (Evans, Hawton, Rodham & Deeks, 2005).

Contemporary thinking considers intentional (non-fatal) self-harm to be a largely teen-related phenomenon (Fogarty, 2007). Research shows that the self-harm follows a progression that is typical of other problem adolescent behaviours, with the behaviour starting in early adolescence (typically age 12), becoming most frequent in middle adolescence/young adulthood (aged 16-25), and disappearing in early adulthood (McDougall & Brophy; 2006; Whitlock, Powers, & Eckenrode, 2006; Yip, 2006). Self-harm behaviours are particularly problematic as there is good evidence to suggest that youth who engage in such behaviours have a higher subsequent risk of suicide (Suicide Prevention Australia, 2011). Suicide on the other hand occurs in all age groups and its prevalence is highest in middle adulthood and late older adulthood in some countries such as the US (e.g., McKeown, Cuffe, & Schultz, 2006) and Australia, and more prevalent in youth in other countries, such as New Zealand and Canada.

9.1 Incidence and prevalence of self-harm and suicide-related phenomena

Evans et al. (2005) conducted a comprehensive international review of population-based studies on the prevalence of adolescent suicidal phenomena. In this study, adolescence was defined as 12 to 20 years. Their review included 128 studies and considered several aspects of nonfatal suicidal phenomena in youth including suicide attempts, intentional self-harm, planning a suicide, and thoughts of suicide. The results of the study are summarized in Table 9.1. Mean prevalence indicates the percentage of adolescents estimated to have engaged in the behaviour or thought about it. The risk ratio by gender refers to comparisons between females to males on the prevalence of these behaviours and thoughts, with the P-value showing the statistical significance of the ratio.

Table 9.1 Mean prevalence of and risk ratios for adolescent suicidal phenomena

	Mean Prevalence %	Risk Ratio (Gender)	P
Suicide Attempts			
Lifetime	9.7	1.78	<0.001
Previous Year	6.4	2.08	<0.001
Intentional Self Harm			
Lifetime	13.2	1.25	0.09
Previous Year	26.0	*	--
Suicide Plan			
Lifetime	15.6	1.64	<0.001
Previous Year	12.4	1.58	<0.001
Suicide Thoughts			
Lifetime	29.9	1.38	<0.001
Previous Year	19.3	1.57	<0.001

Adapted from: Evans et al. (2005) * In the Evans et al. (2005) review, only three studies looked at intentional self-harm by gender and none used the “previous year” as the respondent timeframe.

As can be seen in Table 9.1, suicidal thoughts and behaviours are common among youth, with about 30% at least having thought about suicide at some time during their lifetime. About 10% of youth in the studies examined reported having attempted to take their life. The results for intentional self-harm were wide ranging, in part because of a lack of studies investigating this behaviour. Lifetime intentional self-harm ranged from 4%-30% in the seven studies that investigated this behaviour, while intentional self-harm over the past year ranged from 20%-32% in the two studies using this timeframe. Further to these findings, a more recent population-based study in the US found that 46.5% of adolescent reported self-harm in the past

year (Lloyd-Richardson, Perrine, Dieker, & Kelley, 2007). Thus, taken together, it is likely that intentional self-harm behaviours among adolescents are common, and may be more common than just ‘thoughts’ about suicide.

Analysis of prevalence by gender shows that all thoughts and behaviours were more common among females than males. This difference was statistically significant for timeframes for suicide attempts, plans, and thoughts. Again, due to the paucity of population-based studies of intentional self-harm, the higher prevalence for women was not statistically significant. More recent data from the US found no statistical gender difference for intentional self-harm (Lloyd-Richardson et al., 2007).

With respect to suicide, Table 9.2 shows national suicide incidence rates (per 100,000 people) for three developed countries (Australia, Canada and the USA) by age groupings. The data shows that suicide across the lifespan is higher among males than females. In Australia at least, the incidence of suicide is lower in the 15-24 year age group (8.3/100,000 pop.) compared with all other five-year age groups (not shown) (ABS, 2011).

Table 9.2 Suicide incidence rate[^] for selected ages in Australia, Canada and USA

	Male	Female	All
Australia (2009)*			
15-24 years	12.5	3.9	8.3
All ages	14.9	4.5	9.7
Canada (2005)**			
15-19 years	13.4	6.3	9.9
20-24 years	20.1	5.9	13.2
All Ages	17.9	5.4	11.6
USA (2006)***			
15-19 years	11.6	2.8	7.3
20-24 years	21.0	3.6	12.6
15-24 years	16.1	3.2	9.8
All Ages	18.0	4.5	11.0

[^] per 100,000 population* Australian Bureau of Statistics (2011); **Statistics Canada (2009)

***Centers for Disease Control and Prevention, 2009b

In relation to non-fatal self-harm, a total of 7,299 hospitalisations were recorded for injuries due to intentional self-harm among young people aged 12 to 24 in Australia, 2005-2006. This translated into a rate of 197 separations per 100,000 youth. The rate of separations represents a 43% increase on the rate reported for this age group for the period 1996-1997 (138/100,000 population) (Eldrige, 2008). Further analysis of

this data for the period 2005-2006 shows that females aged 15-17 years have the highest separation rate at 426/100,000 population compared with other females aged 12-14 and 18-24 years and males aged 12-14 and 18-24 years (Eldrige, 2008). These figures most likely underestimate the true rate of self-harm among this age group as it is thought the majority of self-harming individuals conceal their injuries and do not seek treatment (Marti et al.; 2010). A more recent national epidemiologic study of self-reported self-injury (Martin et al., 2010) involving over 12,000 respondents aged 10 years and older noted that the 12-month prevalence of self-injury (weighted by age, sex and state/territory of the Australian population) was highest for those aged 10-17 years and 18-24 years, particularly for females *versus* males (6.3% *versus* 4.6% and 9.4% *versus* 4.7% respectively) (see Table 9.3).

Whilst not specific to the younger age samples, self-reported self-injury in the four weeks prior to the national survey (*versus* no report of self-injury in the preceding four weeks) was found to be associated with significantly increased odds of suicidal ideation (OR=11.3) and a suicide attempt (OR=41.6) in the preceding 12 months of the survey (Martin et al., 2010). This finding suggests that self-injury may be a significant correlate or predictor of contemplation to end one's life and an actual attempt to do so.

Table 9.3 12-month prevalence of self-reported self-injury; by age and sex, Australia, 2009

Age Group (years)	Males		Females		All	
	Count	%	Count	%	Count	%
10-17	35	4.6	44	6.3	79	5.4
18-24	32	4.7	62	9.4	94	7.0
25-34	36	3.8	17	1.8	53	2.8
35-44	24	2.4	26	2.6	50	2.5
45-54	12	1.3	13	1.4	25	1.3
55+	5	0.3	9	0.5	14	0.4
All ages	144	2.4	171	2.8	315	2.6

Source: Martin et al.(2010)

The most recent analysis of suicide in Western Australia 2000-2008 showed that the age-specific rate per 100,000 population significantly increased from 15-19 years of age to 20-24 years, peaking at 25-29 years for both males and females. The rate was significantly higher for males than females at all three young age groups (Ballestas et

al., 2011). Similarly, the age-specific rate of hospitalisation in Western Australia for the same period due to self-harm injuries was highest for males than females in all three young age groups, though the peak rate for males was observed at 15-19 years compared with 25-29 years for females (Ballestas et al., 2011). Overall, suicide was the leading cause of death in 2009 for West Australians aged 15-24 years (14.2 deaths per 100,000 population), largely due to the very high rate among males (24.8) compared with females (1.3) (ABS, 2009b).

Other Western Australian research of non-fatal suicidal phenomena showed that around 8% of young Western Australians had ‘...thought about taking their own life...’ (Couchley et al. 2006 p. 11) with a greater number of women reporting serious consideration of suicide (11%) compared with young men (4%). In relation to hospitalisations in Western Australia 2000-2008 due to self-harm, females accounted for the larger proportion of bed days in the 15-24 year age group: 6,909 days versus 3,570 days (Ballestas et al., 2006).

9.2 **Risk factors for self-injury, suicide, and other suicide-related phenomena**

Research has identified a number of risk factors for self-injury and other suicide-related phenomena. Unfortunately not all of the studies reviewed below have identified the risk associated with the relevant factors for adolescents and young adults.

As previously noted, age and gender are significant risk factors for non-fatal self-harm and suicide. Non-fatal self-harm is primarily an adolescent-young adult phenomenon, with young females twice as likely as young males to engage in self-harm behaviour (Suicide Prevention Australia, 2010). On the other hand, suicide and attempted suicide are not strictly adolescent behaviours, with suicide being most prevalent among Australian males and persons aged 25-54 and 85 years and older (ABS, 2011). However, among Australians aged 15-24 years the suicide rate for males is approximately three times that of females (ABS, 2011). The higher rate for males could be due to their unwillingness to seek help and the more violent and certain nature of the methods used by males (Suicide Prevention Australia, 2011).

In addition to age and gender, there is considerable evidence to show that a range of other socio-demographic factors increase the risk of self-harm and/or suicide,

including residential location, Indigenous status, marital status, unemployment, mental health issues, relationships with parents and peers, and personality type.

In the USA, the risk of suicide appears to be greater for youth residing in areas that are geographically isolated, low in population density, and lacking in community resources and ready access to health care (STIPDA, 2008). In Australia, the analysis of all-age suicide and other self-inflicted injury deaths 1997-2007 by region showed that rates were similarly lower in the capital cities and other major urban areas compared with the rest of the state. In the most remote and socially disadvantaged areas of Australia the death rate was nearly double that for the least remote and least disadvantaged areas and significantly higher for males compared with females in these across all areas (Page et al., 2006). Unfortunately no findings were presented by age and location. Western Australian suicide data for the period 2000-2008 similarly shows that the rate in outer regional, remote and very remote areas of the state is higher than that observed in major Western Australian cities (Ballestas et al., 2011). Given the relationship between remoteness and social disadvantage, suicide rates were similarly found to increase with increasing social disadvantage of the area of residence of Western Australians suiciding in that period (Ballestas et al., 2011). As with the previous study by Page et al. (2006), Ballestas et al. (2011) did not present findings by age for location of residence or social disadvantage.

In Australia and elsewhere, Indigenous status has been identified as a risk factor for suicide across all ages and particularly among males. Silburn, Glaskin, Henry & Drew (2012) notes that suicide rates among Indigenous Australians, Canadian First Nation people, American Indians and New Zealand Maori people have increased in recent decades and is significantly higher compared with non-Indigenous persons. This is particularly so for Indigenous males of all ages and Indigenous women under 25 years. For period 2001-2010 in Australia, suicide accounted for 4.2% of death among Indigenous compared with 1.6% for all Australians (ABS, 2012). For those aged 15-19 and 20-24 years, Indigenous males and females were respectively 4.4 and 5.9 times and 3.9 and 5.4 times more likely to suicide compared with their non-Indigenous counterparts. In Western Australia, Ballestas et al. (2011) reported that during the period 2000-2007 Aboriginal people were 2.3 times more likely than non-Aboriginal people to die through suicide (no findings by age), while Silburn et al.

(2012) reported significantly higher rates of hospital admission, 2001-2005, for non-fatal self-harm for Indigenous aged 15-24 years compared with non-Indigenous.

Evidence has also been presented to show that marital status may be a risk factor for suicide related behaviours. A large-scale study of attempted suicide in the US during the 1980s found that the risk was 11.3 times higher for people who were divorced or separated than for those who were married, widowed, or never married (Petronis, Samuels, Moscicki, & Anthony, 1990). Other large-scale studies have also found a high risk of suicide attempts for those who are separated or divorced (e.g., Moscicki, O'Carroll, Rae, Locke, Roy, & Regier, 1988).

In relation to self-harm, a study in Oxford, UK examined factors among 13,858 people presenting to a general hospital over a ten year period (Hawton, Harriss, Simkin, Bale, & Bond, 2003). Whilst the findings are not specific to adolescence and young adults, the study found when compared to *married* people presenting at the same hospital for reasons other than self-harm, the risk of self-harm was higher for *single* females (relative risk: 4.3) and males (relative risk: 5.6); *divorced* females (relative risk: 6.6) and males (relative risk: 3.9); and for *widowed* females (relative risk: 0.9) and males (relative risk: 1.7). Similar results have been found in other studies (e.g., Harris, Hawton, & Zahl, 2005; Welch, 2001). Risk of suicide is also related to marital status. A study by Smith, Mercy, and Conn (1988) examined the risk of suicide by marital status and age for all US residents over a three year period. The study found that for all age groups and for both males and females, married people had a lower risk of suicide than unmarried people. Further, males aged 25-34 who were widowed had a significantly higher rate of suicide (about 165/100,000) when compared with same aged males who were never married (about 20/100,000), married (about 20/100,000), or divorced (about 60/100,000). Other studies by Gove (1972) and Kessler, Borges, & Walters (1999) support these findings.

Across all ages, being unemployed appears to increase the risk of all types of suicidal phenomena. An extensive synthesis of the literature on suicide attempts found strong support that being unemployed increased the risk of suicide attempts and that risk increased with the duration of unemployment (Welch, 2001). The Oxford study found a nine to ten-fold increase in the risk of self-harm among those who were unemployed (Hawton et al. 2003). Platt (1984) and others (e.g., Blakely, Collings, &

Atkinson, 2003) have established that unemployment is a risk factor for successful suicide in the US and many European countries, while others have noted that both suicide and attempted suicide rates increase during severe economic times (e.g., Ostamo, Lahelma, & Lönnqvist, 2001).

As might be expected, the risk of suicidal phenomena for all persons is associated with a number of mental health conditions. One review found that in studies of self-harmers who presented to hospitals, 90% had at least one psychiatric disorder, most commonly depression followed by substance abuse and anxiety disorders (Skegg, 2005). A different literature review also concluded that having a mental disorder was associated with the occurrence of suicidal phenomena (Welch, 2001). This review found that the most common diagnosis among people who have engaged in suicidal phenomena were depression, panic and anxiety disorders, and, less commonly, schizophrenia, psychotic disorders, personality disorders, and adjustment disorders. Welch (2001) also noted that co-morbidity of disorders was common. Studies of attempted suicide have consistently found high risk among those with affective disorders, such as depression (e.g., Tondo et al., 1999). In Western Australia, Crouchley and colleagues (2006) reported that young adults who had been diagnosed with a mental health problem were five times more likely to have seriously considered suicide.

Consistent with some of the findings reviewed for the preceding health risk behaviours, relations between youth and their parents and peers have a bearing on self-harm and suicide-related phenomena. Martin & Waite (1994) identified a significantly higher relative risk of suicidal thoughts, deliberate self-harm, and depression among Australian high school students who perceived their parents to be 'affectionless and controlling'. Somewhat consistent with this finding, Peter, Roberts & Buzdugan (2008) reported statistically significant associations between negative parent attachment, friendships with 'deviant' peers and suicide ideation for a national longitudinal study of Canadian youth aged 12-15 years, while Lai & McBride-Chang (2001) reported that suicide ideation was more frequent among a sample of Hong Kong students aged 15-19 years who rated their parents as authoritarian, overly controlling, and lacking 'warmth' toward them.

The investigation of personality-behavioural correlates of self-harm and suicide-related phenomena among youth has identified a number of significant traits. For example, anti-social behaviour (Swahn, Ali, Bossarte, Van Dulman, Crosby, Strine & Raskin, 2010), poor emotional regulation (Goldstein, Flett, Wekerle & Wall, 2009; Swahn et al., 2010), higher levels of sensation seeking and openness to new experiences (Goldstein et al., 2009) have been reported to be associated with deliberate self-harm. In contrast, Klonsky & May (2010) failed to demonstrate a significant relationship between sensation seeking and attempted suicide, but did find that behavioural styles related to impulsivity including high urgency and poor premeditation respectively predicted attempted suicide and suicide ideation, and, suicide attempts among high schools students. Of the above personality-behavioural correlates, sensation seeking is the only factor that has been linked with young driver risk taking. It is feasible to consider however, that behavioural styles of poor emotional regulation and premeditation, urgency, and anti-social behaviour might impact on the decision making of young drivers and increase young driver risk taking and subsequent crash involvement.

9.3 **Intentional self-harm and young driver crashes**

Various studies have suggested that fatal motor vehicle crashes may be linked to suicide and self-harm (see e.g., De Leo & Heller, 2004; Ostamo & Lönnqvist, 2001). Indeed, recent work has provided convincing evidence of this linkage. A prospective cohort study in Australia investigated the risk that intentional self-harm posed for motor vehicle crashes among young drivers by linking data from the DRIVE study in New South Wales to police-reported crash data (Martiniuk et al., 2009). Of the 18,871 young drivers participating, 4.6% reported to have engaged in true self harm behaviour. Of the people who reported self-harm behaviour, 10.1% had at least one crash. Multivariate analyses showed that after controlling for age, sex, driving exposure, crash history, and a number of other variables, young people who reported self-harm had a relative crash risk of 1.37. The authors consequently concluded that self-harm was an independent risk factor for motor vehicle crashes among young people.

9.4 **The role of alcohol and drugs in suicide**

A number of studies have investigated the relationship between suicide attempts and use of licit/illicit substances, but the findings are not entirely consistent. For example,

a study of nearly 14,000 Americans who had attempted suicide found that active alcoholism and use of cocaine were associated with a higher risk of suicide attempts, whereas use of marijuana, sedative-hypnotics, and stimulants were not (Petronis, Samuels, Moscicki & Anthony, 1990). A study of risk factors for attempted suicide among adolescents found an increased attempted suicide risk for use of alcohol, hallucinogen, cocaine, amphetamine, inhalant, and sedative hypnotics, but no increased risk with marijuana use (Kelly, Cornelius, & Lynch, 2002). A study of suicide among adolescents, based on interviews with survivors and analysis of medical records, found that substance use was found in nearly one-half of suicides, predominantly alcohol (Schneider, 2009). A state-wide survey of adolescents in South Carolina, US found that suicidal behaviour requiring medical care was significantly more common among those adolescents who reported alcohol binge drinking (Odds Ratio, OR, = 2.1), marijuana use (OR=2.4), cocaine use (OR=3.6) , and Illicit drug use (OR=2.5), particularly intravenous drug use (OR=6.9) (Garrison, McKeown, Valois, & Vincent, 1993).

Alcohol and illicit drugs have also been implicated in the suicides of young people in Western Australia. An investigation by Hillman, Silburn, Green & Zubrick (2000) of the Coronial reports of suicides of those aged 15-24 years over the period 1986-1987 found that almost half of male suicides and a third of female suicides had blood alcohol readings greater than 0.05 (the WA legal limit for driving). Further, nearly a third of WA male suicides and over a quarter of females had illicit drugs detected on examination. After alcohol, the drugs most commonly associated with suicide were cannabis (detected in 20% of males and 11% of females), stimulants (9% of males and 8% of females) and opiates (7% of males and 12% of females). Those with a history of drug use were more likely to have had illicit drugs detected upon post-mortem toxicological analyses.

It is possible that alcohol and other drug use *may* increase the risk of suicide through three short term effects of association: by increasing the likelihood of impulsive suicide, through the indirect effects of longer term or dependency, or by exacerbating existing mental health disorders.

9.5 Self-harm and suicide interventions

As described by Skegg (2005), the management of self-harm behaviour is quite varied but should be based on treating the underlying problem. Treatment can thus range from psychiatric hospital admission to resolving family support issues. Based on a comprehensive review of the literature, Skegg also stressed the need for aftercare to prevent the reoccurrence of self-harm behaviour and presented the following general principles:

- Monitor patient for further suicidal or self-harm thoughts;
- Identify support available in a crisis;
- Come to a shared understanding of the meaning of the behaviour and the patient's needs;
- Treat psychiatric illness vigorously;
- Attend to substance abuse;
- Help patients identify and work toward solving problems;
- Enlist support of family and friends;
- Encourage adaptive expression of emotion;
- Avoid prescribing quantities of medication that could be lethal in overdose;
- Assertive follow up in an empathic relationship;
- Affirm values of hope and caring for oneself.

As with self-harm, suicide prevention strategies are also quite varied. Many countries undertake comprehensive national prevention strategies in an effort to address the multitude of factors related to suicide to target various 'at risk groups' such as men, youth and rural residents (Martin & Page, 2009). Consequently, a "...national strategy needs to be multi-faceted, multimodal, operate at all levels of government, from bureaucracy through to society, community, family and the individual (Martin & Page, 2009, p. 6). Based on their multi-country review of the effectiveness of national prevention strategies, Martin & Page (2009) concluded that the most effective national strategies for all members of the population, including youth:

- Identifies strategies and goals that are evidence based.
- Have clearly stated outcomes or targets.
- Are truly nation-wide in their approach with a whole of population approach to communication and education and the provision of services.

- Restrict as best as possible access to the means to suicide (i.e., gun control, control of pharmaceuticals to reduce the risk of over-dose).
- Are explicit and strategic in dealing with the role of alcohol and illicit drugs.
- Understand how initiatives in other portfolio areas (e.g., illicit drugs and alcohol control; education; community welfare) might impact on suicide.
- Have a commitment to evaluation to determine what works, why and how.

One other noteworthy review of suicide prevention strategies involved suicide experts from 15 countries who collaborated on a systematic review of more than 5,000 prevention studies published up until June, 2005 (Mann et al. 2005). This systematic review of literature categorized studies into five types: awareness and education; screening; treatment interventions; means restriction; and media. The conclusions from this review for the five areas are presented in the following sections.

9.5.1 **Awareness and Education**

Awareness and education strategies are designed to increase knowledge of recognizing suicide risk and improving understanding of the causes and risk factors. Suicide awareness and education programs have been developed for the general public, primary care physicians, and gatekeepers (those who have contact with potentially vulnerable populations). Mann et al. (2005) reported that there are few studies that have evaluated the effects of awareness/education programs for the general public, but those that have shown little evidence that general public awareness programs reduce suicide risk. Indeed, in some cases these programs may even have a harmful effect. Awareness and education programs targeted at primary care physicians have been more promising. According to Mann et al. (2005), studies in several countries have shown that programs that help physicians identify and treat at-risk patients can substantially reduce suicide rates by as much as 50%. Few programs for gatekeepers have been evaluated. However, two programs targeted toward military institutions have reported success in reducing suicide risk among those in the military. For example, a intervention study based on social norming with the US Air Force found a 33% reduction in suicide risk (Knox, Litts, Talcott, Catalano & Caine, 2003).

9.5.2 **Screening**

Screening refers to identifying people at risk for suicide attempts and directing them to treatment. According to Mann et al. (2005), several studies have found that screening is effective in identifying and treating people with depression. No studies have found that screening programs reduce suicide risk for youth. Indeed, a systematic review of the literature on screening to reduce suicide risk, as opposed to depression in the primary care setting, found no studies that investigated suicide risk (Gaynes et al. 2004). Thus, it appears that screening is effective at identifying those with risk factors for suicide, such as depression, but that screening has not been shown to reduce suicide risk. Mann et al. (2005) cautioned that further consideration is needed regarding the cost effectiveness of screening for the general population for suicide risk.

9.5.3 **Treatment interventions**

Both pharmacotherapy and psychotherapy have been used as suicide prevention strategies. In their systematic review of the literature, Mann et al. (2005) reported that there have been few randomized control trials of the effects of medication (particularly anti-depressants) on suicide risk. However, data from several countries show that higher prescription rates of antidepressants correlate with decreasing suicide rates in both adults and youth. Mann et al. (2005) noted that suicide rates were reduced the most in countries that had the greatest increase in selective serotonin reuptake inhibitor (SSRI) prescriptions. While the authors recognized that one cannot infer causation from these correlations, they noted that there is a plausible link between antidepressant use and decreased suicide risk. Psychotherapy also seems to be an effective treatment for reducing suicide risk. Mann et al. (2005) found that when compared to normal aftercare, some forms of psychotherapy could reduce risk of subsequent suicide attempts by one-half.

9.5.4 **Means restriction**

Means restriction refers to reducing access to the means by which a person may attempt to commit suicide, such as firearms or prescription medications. According to Mann et al. (2005), suicide by specific means has been reduced when restrictions are placed on that mean, such as firearm control legislation, restrictions on pesticides, construction of barriers at jumping sites, and the introduction of lower toxicity antidepressants. Studies have yet to address whether these restrictions reduce suicide

risk as a whole. It is possible that if one method is restricted, a person may substitute another method.

9.5.5 **Media**

According to Mann et al. (2005), media can play both a positive and negative role in suicide prevention. On the positive side, media can help inform the general public and specialized groups about the risk factors and treatment options for suicide attempts. On the negative side, news coverage of suicides may encourage those who are at risk to attempt suicide. There is some evidence that suppressing news media about suicide can decrease suicide rates. For example, a study in Austria examined the effect of changing how media reported on subway suicides (Etzersdorfer & Sonneck, 1998). The program successfully got media to downplay these types of suicide and in many cases not report on this type of suicide. The study found a more than 80% reduction in subway suicides and suicide attempts with the reduction lasting for several years. Mann et al. (2005) concluded that media-targeted campaigns are a potentially effective suicide prevention strategy.

10. DISCUSSION

This chapter begins with a discussion of the reviewed literature in relation to the development of risk taking and the general implications for initiatives to counter risk taking on the road. This is followed by a discussion of the relationship between risk taking behaviours; a comparative profile of the risk taking of Western Australian youth compared with youth elsewhere; a summary of the effective or potential countermeasures to reduce risk taking, and the implications of the reviewed material to improve young driver safety. The chapter concludes with the presentation of a number of recommendations for policy and practice and further research.

10.1 Biopsychosocial development and risk taking behaviour

Understanding why youth and young adults engage in risk taking behaviours is essential to the development and implementation of appropriate countermeasures. The theoretical perspectives on the development of risk taking succinctly summarised by Boyer (2006) and Steinberg (2008) and supported by others such as Dahl (2008) suggest that risk taking is a normal part of teenage development. Though how it is expressed and to what degree depends on a number of other, complex factors.

The biologic view of risk taking proposes that a combination of biochemical and neuronal maturational factors limit reasoning ability, cognitive control, and emotional regulation required to moderate risk taking. Evidence supporting this proposal is still at best speculative because of the correlational rather than causal nature of the evidence (Johnson & Jones, 2011). This seemingly deterministic and ‘inevitable’ view of risk taking should not mean however, that risk taking cannot be managed or countered. To the contrary, there is reason to consider that initiatives which focus on challenging and altering the cognitive and emotional precursors and responses associated with risk taking could help youth better manage their risk taking behaviours. A good example of this is the emerging evidence for the successes of training and education programs for youth that aim to develop cognitive and emotional skills (sometimes referred to as resilience or life training) to deal with stresses and conflict in life that may lead to, for example, the use and abuse of alcohol and other substances (Brown, 2001), which as discussed, can lead to greater risk taking on the road by way of drink and drug affected driving. Any initiative that contributes to a reduction in the use of substances that impair the cognitive abilities

and emotional regulation of young people has the consequent potential to reduce the incidence of impaired driving and the risk of crashing and injury among young people.

The social development perspective on risk taking highlighted the important and influential role of parents and peers in the engagement of risk taking behaviour by youth. These influences are reflected in Jessor's (1987) conceptual framework for the engagement in problem behaviours through the perceived environmental and individual behavioural systems. As discussed, the behaviour that parents and peers model as acceptable, appropriate and even 'normative' can influence the behaviour of youth (Boyer, 2006). There is also good and reasonably consistent evidence that adolescents are "...more prone to peer and status-sensitive influences on risk decision making.." (Dahl, 2008 page S280). Given the potential influence of both parents and peers there is a strong need to consider both groups when developing and implementing initiatives to address risk taking on the road to both counter their negative influence and build positive influence. On this point there is also emerging evidence that initiatives that incorporate a role for the family and peers of youth are proving successful in reducing substance use and abuse (Eisen et al., 2000). In relation to driving, Section 4.2.4 provided a range of evidence attesting to the relationship between the driving histories of parents and the driving outcomes of their children and the influence of parental control on the driving practices and outcomes of their children.

The individual and peer/family influences on the development of risk taking discussed above do not occur in isolation of a broader sociocultural, political environment as represented in the conceptual ecological model of adolescent development and injury risk proposed by Johnson & Jones (2011) in Figure 10.1. Consequently it is important that communities and governments alike take responsibility for creating an 'environment' that controls and limits the influence of risk factors for youth risk taking while developing and supporting risk protective factors. Johnson & Jones (2011) comment that "...shoring up the social ecology of adolescent risk taking –parents, peers, policy makers, clinicians, and teachers – is key to successful interventions in this age group" (page 52). This perspective clearly dictates that countermeasures should not be restricted to those which solely aim to

develop personal control and responsibility around the behaviour, but should necessarily adopt a holistic approach to youth risk taking and injury.

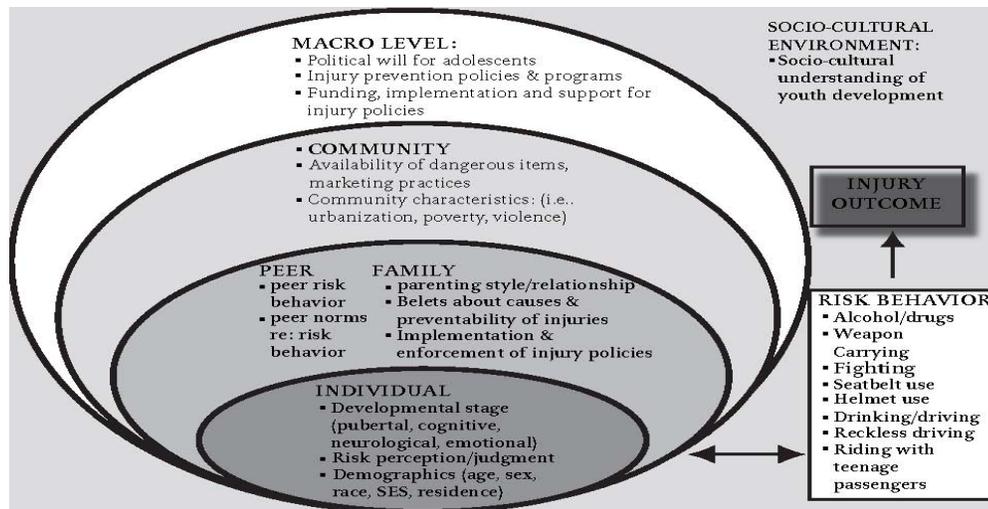


Figure 10.1 Ecological model of adolescent development and injury risk
(source: Johnson & Jones, 2011)

The behaviour and safety of young drivers is thus a whole of society issue. It needs to be recognised that action or inaction at a societal level around issues such as, for example, the availability and consumption of alcohol and other drugs; youth mental health issues, and addressing social and economic disadvantage, will likely impact on youth risk taking on the road and elsewhere.

10.2 The relationship between risk taking behaviours

Road safety practitioners have long been aware that young drivers have a heightened crash risk as well as a pronounced tendency to undertake a range of risky driving behaviours. The research cited in this report clearly establishes that the youth/risk association extends beyond driving to include other health and social risk areas. As a general statement, young people not only have a large representation in these risk areas but (where the research data are available) have a greater involvement rate than other age groups. In most cases this risk is greatest for young males than females.

While the research studies have repeatedly demonstrated the association between youth and the prevalence of risk taking behaviours, only a minority of studies have investigated whether at an individual level a young person engaging in risky driving

behaviour is also the same person likely to be engaging in other health risk behaviours such as substance abuse and the like. The research by Bingham & Shope (2004) and Vassallo et al. (2010) of respective sample cohorts of young Americans and Australians best exemplify the concurrent and longitudinal relationship *within individuals* between risky driving behaviours and other problems behaviours such as substance abuse. Both studies presented evidence to show that youth with substance abuse issues prior to licensing were more likely to engage in risky driving driver behaviours, including speeding and drink and drug driving some years later once licensed. The Vassallo et al. (2010) study also demonstrated a concurrent relationship between risky driving and other risk behaviours including alcohol misuse, use of marijuana, and smoking. These findings provide some evidence to support the idea that risk taking behaviours on the road and elsewhere during adolescence and young adulthood can present as a syndrome of ‘problem behaviour’ as per Jessor’s (Jessor & Jessor, 1997) theory. Vassallo et al. (2010) concluded that:

Risky driving appeared to be one element of a risk-taking lifestyle for a number of young people. Thus, young risky drivers would likely benefit from interventions that not only target their behaviour on the road, but also other aspects of their lives, suggesting a role for more broad based “common solutions” approaches in addition to targeted approaches to road safety (Vassallo et al., 2010, p. 4).

However, because of a dearth of population-based studies specifically investigating the development and co-occurrence of driving and other health risk-related behaviours among adolescents and young adults it is not possible to determine what proportion of the young driver problem (i.e., those who crash or commit traffic offences) can be regarded as ‘problem behaviour’ drivers, that is, young drivers who display risk taking across a number of areas in life. Consequently, it is difficult to estimate the magnitude of effect of a ‘common solutions’ approach to the young driver problem as recommended by Vassallo et al. (2010).

The aforementioned methodological issues have particularly limited the understanding of the relationship among risk taking behaviours for Western Australian youth and young adults. There is no contemporary research evidence of the relationship between risk taking on the road and risk taking in other areas of life for young Western Australians. The most detailed understanding of Western Australian young driver crashes and selected offending behaviour and their causes

(which included some information on other health risk behaviours) was provided by the longitudinal investigation conducted by Stevenson and colleagues in the mid to late 1990's of a sample cohort of young novice drivers. The findings from this study are however only moderately useful to a contemporary population-based understanding of young driver risk taking in WA for three reasons. Firstly because of the non-representative nature of the study cohort and its size; secondly because of the age of the research, and finally and perhaps most importantly, the fact that Western Australia's driver training and licensing system moved to a more contemporary version of graduated licensing in 2002 to improve novice driver skill and safety. On this point, there has been no evaluation to date of the impact of the existing graduated licensing system on young driver crashes and risk taking behaviours (as measured by traffic offences) to determine *if* and *how* these drivers differ to those licensed pre-2002.

The review of information on other areas of risk taking by WA youth has similarly been compromised by a relative lack of detailed research and evidence. Most of the information on the health risk behaviours selected for review is descriptive in nature and has not attempted to statistically validate contributing or explanatory factors. Furthermore, the research has rarely looked at the engagement in multiple risk behaviours by individuals or reported on this in such a way to identify a potential syndrome of 'problem behaviour'.

10.3 **Comparative profile of risk taking by youth in Western Australia and elsewhere**

One of the main objectives of this review was to profile the risk taking of young Western Australians as drivers and in other health related areas and to compare this with the profile of young people elsewhere. Difficulties with the quality and quantity of Western Australian information on risk taking behaviours and the comparability of the available information with that for youth elsewhere has hindered this object. Notwithstanding these methodological issues, the review material has been synthesised in the following sections to provide as best as possible a comparative 'profile' of the risk taking behaviour of Western Australian youth and those elsewhere.

10.3.1 **Driving**

Crashes

Young people in Western Australia and in other highly motorised Western countries are substantially over-represented in road crashes, particularly as drivers. Drivers in Western Australia like elsewhere, such as the USA, are two to three times more likely to be killed compared with older age drivers. Across all locations the crash risk for young drivers was highest in the initial period of licensure and slowly declined with increasing experience and maturity.

Evidence on the characteristics of young Western Australian drivers and others involved in a crash was found to vary in strength and is summarised as follows:

Across all locations there was consistent and good evidence of an increased risk of crash involvement for the following young drivers:

- Males compared with females.
- Those in their earliest months of licensure (e.g. less than 12 months), relative to more experienced young drivers.
- Those with a history of drink driving offences, particularly those of legal drinking age and older; e.g., 18-25 years in Australia, older than 21 years in the USA because of the higher legal drinking age.
- Those who speed and particularly those who engage in high level speeding.

Relative to the above, there is less developed, less consistent evidence of an increased risk of crash involvement for the following young drivers in Western Australia and elsewhere:

- High sensation seeking individuals, relative to those categorised as moderate or low on the measure.
- Those who use mobile phones or text whilst driving.
- Those who drive without a valid licence or have at some stage driven without one.

Compared with Western Australia (for which there was little to no evidence), young drivers elsewhere were more likely to crash if:

- They drove drowsy or fatigued.
- Carrying same aged peer passengers.

- Their parents have poor driving records in terms of crashes and/or traffic offences.
- Their parents are relatively disengaged in terms of parental monitoring and control and are lenient in regards to restrictions around driving.
- They smoke, drank alcohol, and use substances such as marijuana at an early age (i.e., 15 years).

Unfortunately no useful contemporary published information could be found for the effect of the following WA young driver demographic, sociocultural, and driving factors on crash involvement:

- Nationality (including Indigenous status).
- Residential location.
- Socio-economic status.
- Educational attainment.
- Occupation.
- Family structure.
- Parent driving history.
- Histories of licensing, crash and offence behaviour.
- Driving exposure, including hours/days of driving and qualitative dimensions such as the carriage of passengers, type of trip, time of driving.

On-road risk behaviours

Relative to the information available on crash involvement, there was less consistent and useful evidence available to describe the population prevalence of young driver involvement in the selected on-road risk behaviours, and thus to develop a comparative profile of who engages in such behaviours and why. The best evidence was found in relation to drink driving, speeding, and non-use of a seat belt.

Drink Driving

The most recent WA evidence shows that young drivers are over-represented in fatal crashes involving a BAC greater than zero (based on the proportion of the licensed driver population they represent). No published information could be found on the incidence of alcohol related traffic offences for this age group. A direct comparison between Western Australia, Australia, and elsewhere like the USA was difficult because of the older legal drinking age of 21 in the latter country. Thus drink driving

was more an issue for the younger age novices in Australia and older age young drivers in the USA.

There is consistent and good evidence of an increased risk of drink driving for the following young drivers in Western Australia and elsewhere:

- Males compared with females.

Relative to the above, there is less developed evidence of an increased risk of drink driving for the following young drivers in Western Australia and elsewhere:

- Moderate to high sensation seeking individuals, relative to those categorised as moderate or low on the measure.
- Those who frequently consume alcohol.
- Those with a (self-rated) driving style that might be described as ‘anti-social’ and aggressive (e.g., risky, intolerant, aggressive, impatient and hurried).
- A history of unlicensed driving.

In Western Australia, compared with elsewhere, there was some evidence of an increased risk of drink driving for the following young drivers:

- Those with a history of drink driving offences, particularly those of legal drinking age and older (i.e., 18-25 years).

In contrast, there was an increased risk of drink driving by young drivers elsewhere if they:

- Had lower school grades.
- A history of alcohol abuse.
- Used illicit substances such as marijuana.
- If parents and peers use alcohol.

Speeding

There is good evidence to show that young drivers in Western Australia and those elsewhere have a higher risk than older, more experienced drivers of being involved in a speed related crash and to self-report speeding.

There is consistent and good evidence in Western Australia and elsewhere of an increased risk of speeding for the following young drivers:

- Males compared with females.

- Those with a history of speeding offences.
- Younger age, less experienced young drivers (e.g., 17-19 years).

Relative to the above, there is less developed evidence of an increased risk of speeding for the following young drivers in Western Australia and elsewhere:

- High sensation seeking individuals, relative to those categorised as low to moderate on the measure.

In Western Australia, compared with elsewhere, there was some evidence of an increased risk of speeding for the following young drivers:

- Those with a self-rated driving style that is described as confident and adventurous.
- Those who engage in a relatively low level of positive health related behaviour, (based on self-reported drinking, smoking, failure to exercise, and to use sunscreen).

Compared with young drivers in Western Australia, young driver elsewhere were more likely to speed if they:

- Had a disposition toward ‘anti-social’ behaviour.
- Associated with ‘anti-social’ peers.
- Had a history of previous driving offences.
- Had a history of involvement with the criminal justice system.
- Had been unemployed.
- Engaged in multi-substance abuse (e.g., alcohol, marijuana).

Non-use of seat belt

The available evidence shows that non-use of a seat belt by young drivers in Western Australia, and indeed elsewhere in Australia, is considerably lower than that observed elsewhere such as the USA. This is most likely due to the early adoption of seat belt legislation in Australia and the primary enforcement of the legislation relative to other locations such as the USA.

On balance however, it would appear that young drivers in all locations are more likely to be unbelted than their older age counterparts. For example, in Western Australia, roadside observation studies suggest that around 2% of drivers aged 17-29

years travel unbelted, compared with 1% for older age drivers. However, around 10% of drivers aged 16-24 year involved in a crash are unbelted, compared with 5% of drivers aged 40+ years. In addition, drivers aged 16-24 years account for one-third of Western Australian drivers infringed for failing to wear a seat belt and are 60% more likely to be repeat offenders than drivers aged 40+ years.

There is consistent and good evidence of an increased risk of non-use of a seat belt among Western Australian drivers and those elsewhere for the following:

- Males compared with females.

In Western Australia, compared with elsewhere, there was some evidence of high incidence of non-use of a seat belt for the following young drivers:

- Those who reside in rural areas, relative to those residing in metropolitan Perth.
- Those of Aboriginal and Torres Strait Islander background, relative to non-Indigenous persons.

Compared with young drivers in Western Australia, the following young drivers elsewhere were more likely to be unbelted:

- High sensation seeking individuals, relative to those categorised as moderate or low on the measure;
- Those who self-report unlicensed driving.
- Those who engage in a syndrome of problem behaviours consisting of alcohol use, marijuana use, and gambling.

Driver distraction and fatigue

The review failed to identify sufficiently useful evidence in relation to distracted and fatigued driving for young Western Australian drivers and those elsewhere. At best, there is weak/conditional evidence of an increased risk of mobile phone use and other distracting behaviours (i.e., changing CD) by young drivers compared to older drivers in Western Australia and elsewhere. Limited evidence was noted elsewhere that young females were somewhat more likely to engage in in-car distracting behaviours due to applying makeup and texting.

In relation to fatigue, there is minimal conditional Western Australian evidence and to suggest that young drivers/riders have double the risk of older age drivers/riders of being involved in a fatigue related serious injury crash (2% versus 1%), with males

more so than females evidencing a higher risk of being fatigued and crashing. Evidence from elsewhere suggests that fatigue may be more of an issue for drivers 20-29 years of age.

Unlicensed driving

Though unlicensed driving is an emerging problem among young drivers, like the non-use of a seat belt the prevalence of unlicensed driving is thought to be reasonably low, but those who drive unlicensed have a much higher risk of involvement in a serious injury crash. There was no consistent or strong published information for young Western Australian drivers in relation to unlicensed driving. In contrast, more information on this risk behaviour was noted for young drivers elsewhere.

There is varying levels of evidence to suggest that the following young drivers in Western Australia and those elsewhere are likely to drive unlicensed:

- Males compared with females;
- Indigenous persons or those of ethnic minorities.
- Those residing in rural areas.

Compared with young drivers in Western Australia, the following young driver elsewhere were more likely to drive unlicensed:

- Those who are less likely to use a seat belt.
- Those who have lower school grades.
- Those who report drink driving.

10.3.2 **Other risk taking behaviours**

Alcohol use

In Western Australia like elsewhere, the onset of adolescence is associated with a marked increase in alcohol use. Around three quarters of Western Australia's young people aged 18-30 years reported regular use of alcohol. Although many reported drinking within acceptable levels from both health and social perspectives, around one-quarter were considered to be drinking at risky levels.

There is reasonably consistent and good evidence of an increased use of alcohol by the following young Western Australians and those elsewhere:

- Males compared with females.
- Older age young people (e.g., 20-24 years versus 17-19 years).
- Indigenous compared with non-Indigenous.
- Those with a network of peers that consume alcohol and where alcohol is part of the ‘social fabric’.

Elsewhere there was good evidence to show that alcohol use was more common among the following young people:

- Those whose parents consume alcohol.
- High sensation seeking individuals relative to those categorised as moderate or low on the measure.
- Those attempting to cope with negative emotional states.

Smoking

The rate of smoking amongst young people in Western Australia varied with age – with one survey reporting that around one-fifth of those 16-19 years were smokers, with the proportion increasing to one-third of those aged 25-29 years and declining with increasing age. It has been difficult to arrive at an overview of young people’s smoking prevalence across different countries – in part because there were wide variations in smoking prevalence country to country, in part because the estimates of prevalence were based on different methods and used different age and smoking parameters. However there is some evidence to suggest that smoking rates for Australian young people were relatively low.

In Western Australia and elsewhere there was good evidence to show that prevalence of smoking was similar among young males and females but significantly higher among the following young persons:

- Indigenous compared with non-Indigenous.
- Lower educational and socioeconomic backgrounds.
- High sensation seekers relative to low to moderate sensation seekers.

Elsewhere there was some evidence that the following youth were more likely to be smokers:

- Those whose parents smoke.
- Those with a range of psychological and emotional disorders.

- Those who consume alcohol and other substances.

Illicit substance use and abuse

Fewer Western Australian youth use illicit drugs compared with those who use alcohol and smoke. Survey data shows that marijuana use is highest among youth (ranging from 6.7% to 15.7%), followed by amphetamines (4.3% to 12%) and ecstasy (1.8% to 11.4%). In contrast, around one in three American youth report use of some illicit drug with most using marijuana, as was the case for other Australian youth.

There is some evidence of a higher prevalence of illicit drug use among the following young people in Western Australia and elsewhere:

- Males compared with females;
- Indigenous compared with non-Indigenous (marijuana use specifically);
- Older age young people compared to younger (e.g., 20-24 years versus 16-19 years).

Elsewhere, the following young persons were more likely to use some form of illicit substance:

- Those whose parents and peers use illicit drugs.
- Those subject to a range of socioeconomic factors such as financial, educational, and environmental disadvantage.
- Those whose family circumstances include parental conflict, low parental monitoring; poor communication within families; low emotional attachment.
- Those with an aggressive behavioural style.
- High sensation seeking individuals, relative to those categorised as moderate or low on the measure.

Sex and unsafe sexual practices

Just under one-half of Western Australian youth had their first sexual encounter under the age of sixteen years, with over one-half of those aged 16-19 years having had sexual experience. The extent of 'safe sex' practices varied from study to study but evidence suggests that nearly one-half of all sexually active young women did not insist on condom use – with one-third of young men not using condoms. In Australia overall, it appears that both the prevalence of sexual activity and the

number of different partners in sexual activity are increasing – with a recent survey showing that around one-quarter of Year 10 and one-half of Year 12 students were sexually active. Although the levels of condom use were stable across recent years, condoms were not used in over one-quarter of the most recent sexual encounters. This situation is similar to overseas findings, where many young people report an active sexual life and where typically condom use is high but far from universal.

There is some evidence of a lower incidence of condom use and good evidence of a higher incidence of sexually transmissible disease among the following young people in Western Australia and elsewhere:

- Females compared with males.
- Indigenous compared with non-Indigenous though in Western Australia the evidence for a lower of condoms was less direct and related more to the higher prevalence of sexually transmissible diseases associated with unprotected sex.
- Older age young people compared to younger (e.g., 20-24 years versus 15-19 years) (sexually transmissible disease only).

Elsewhere there was good evidence of a decreased use of condoms and/or higher incidence of STD among for the following young people:

- Those who use alcohol.
- High sensation seeking individuals relative to those categorised as moderate or low on the measure.
- Earlier sexual abuse victimisation.
- Those whose peers engage in risky sexual behaviour.
- Those who lack a positive and clear communication style with parents around sexuality.

Intentional self-harm and suicide related phenomena

Suicide is the leading cause of death among young Western Australians (14.2 deaths per 100,000), with around 8% of young people having seriously considered taking their own life. Internationally, suicide rates were comparable across Australia, Canada and the USA, with rates in most cases being somewhat higher among those aged 20-24 years compared with 15-24 years.

There is good to reasonable evidence of a higher risk of suicide and/or self-harm among the following young people in Western Australia and elsewhere:

- Males compared with females (suicide) and females compared with males (self-harm and suicidal thoughts).
- Those with a history of mental illness.
- Indigenous compared with non-Indigenous (implied for younger ages in WA).
- Those residing in rural locations.

Elsewhere, suicide and/or self-harm was more prevalent among the following young people:

- Those with some form of personality, behavioural or conduct disorder and with poor emotional regulation.
- High sensation seeking individuals, relative to those categorised as moderate or low on the measure.

There is good evidence implicating the use of the following by those young Western Australians who have contemplated suicide:

- Alcohol; use and/or history of illicit substance use, and the abuse of legal pharmaceuticals.

10.4 **Effective and/or potential interventions for reducing youth risk taking behaviour**

This section provides a summary of the information reviewed in relation to the most effective initiatives or initiatives that show potential for reducing youth risk taking on the road and elsewhere.

10.4.1 **Young drivers**

Graduated Licensing

Graduated driver licensing programs have emerged as the most effective contemporary strategy for reducing young driver crashes. As discussed, these programs entail young drivers being subject to a range of conditions during their initial months/years of unsupervised solo driving to reduce their exposure to known high risk driving situations while they continue to gain experience and skill. Many evaluations attest to the safety benefits of graduated licensing and particularly, the

benefits of night-time driving restrictions and restrictions on the number of peer passengers.

On many fronts graduated driver licensing programs address the biopsychosocial factors associated with youth risk taking on the road. On this issue, Johnson & Jones (2011) consider that graduated licensing programs allow novices "...to age out some of the developmental vulnerabilities for crashes, while gaining driving experience in less demanding conditions.." (page 53). For example, passenger restrictions seek to neutralise any influence of peers on risk taking behaviour in the initial period of licensure, while (late night) night-time restrictions on driving may lessen the potential impact of fatigue and sleep deprivation –which is thought to be rampant among adolescence (Dahl, 2008) –on late night driving. Other initiatives such as a requirement for zero Blood Alcohol Concentration during the provisional licence period serves to moderate the consumption of alcohol by youth and to control the well-known influence of alcohol, even at very low levels, on the driving abilities of youth. Measures such as these create a driving environment that takes into account the developmental stage of the novice and the risk it entails.

Engaging parents in the learning to drive and early solo driving phase

Graduated licensing programs also promote the importance of parents in the development of driving experience during the learner period in an effort to reduce young drivers' crashes once licensed. Parents have also been used as a means to impose and/or reinforce restrictions on young drivers during their early period of solo driving. The emerging evidence indicates that parent who are engaged and involved in providing supervision and developing or reinforcing restrictions around early solo driving can have a positive impact on young driver crashes. These findings are somewhat tempered by other evidence that parents can also have a negative impact on young driver outcomes if parents themselves have a poor driving history characterised by crashes and/or offences.

Driver education

Driver education and training programs take many forms. The results from early evaluations and reviews suggest that these programs, particularly school based programs, have minimal impact on the high crash rates of young drivers, with five possible reasons offered for the lack of safety benefits:

- Driver education has in the past failed to teach the knowledge and skills that are critical for safe driving.
- Driver education does teach safety skills, but students have little if any motivation to use them.
- Driver education fosters overconfidence in young drivers.
- Driver education fails to adequately address the role that lifestyle plays in crashes.
- Driver education fails to tailor content to students' needs.

More recently however, there is increasing positivity around driver education programs that focus on providing young drivers with insight of the influence on driving outcomes of their non-safety related attitudes, their propensity for risk taking behaviours, and their inexperience and lack of skill. In addition to this, programs that have a foundation in resilience education and provide young drivers with better decision making skills and other life skills to deal with peer pressure and emotional regulation show some promise but require further investigation. The most encouraging of these was reported by Senserrick et al. (2009). In Western Australia, the SDERA's *Keys for Life* program and the *Aussie Optimism Program* –two school based resilience initiatives - have potential to reduce young driver risk taking.

10.4.2 **Alcohol use**

Given young people's propensity to use and abuse alcohol and given also the many health and other risks associated with this pattern, it is not surprising that many educational programs have been devised and implemented to counter alcohol abuse. While many of these programs have reported especially short-term reductions in alcohol use, overall this general strategy is considered to have at best, limited effectiveness.

Increasingly, greater hope is being placed on environmental restrictions that include:

- Increasing compliance with underage drinking laws by decreasing social and commercial access to alcohol.
- Reducing consumption and risky alcohol use by placing restrictions on where and how alcohol is sold and distributed, how much alcohol costs, and where it is consumed.

- Decreasing specific types of alcohol-related problems, such as traffic crashes, by creating youth-specific blood alcohol content (BAC) laws.

Other evidence suggests that programs which incorporate a strong role for families and parents are moderately effective in delaying the use of alcohol and/or reducing alcohol consumption by youth. Similarly, the local *Aussie Optimism Program* with its focus on the development of social life skills and optimistic thinking skills through school and family intervention shows good potential to reduce alcohol use by youth.

10.4.3 **Smoking**

Interventions to better manage young smokers occur at two broad levels.

Smoking cessation programs

The many programs falling in this area include educational strategies, medical strategies (to ease the physical effects of withdrawal) and ‘other’ strategies (including reduced access to cigarettes through either pricing or regulatory restrictions). Numerous meta-analyses have concluded that teen smoking cessation programs are effective, with the size of benefit varying somewhat across the different intervention strategies. However, even in the best performing programs the advantage of attending a program was small.

Smoking prevention programs

Meta-analyses and reviews of school-based educational programs using a variety of learning models have shown that these programs have at least short-term benefits in reducing adolescent smoking – but the evidence for long-term benefits is largely absent. One local mental health promotion resilience based program (i.e., Aussie Optimism) showed promising evidence of reducing the use of tobacco by early secondary school age children. Some prevention interventions employ a broader strategy by tackling key social conditions (including reduced access to tobacco through age restrictions and mass media efforts). While further evaluation evidence in this area is required, there is limited evidence that coordinated, multi-component programs can be more effective in reducing smoking amongst young people than single strategies alone.

10.4.4 **Illicit substance use and abuse**

While the education sector in particular runs many drug use prevention programs and while there have been many formulations advising on the structure, content and delivery of these programs, their effectiveness in preventing drug use is essentially unknown. Mass media campaigns are also plentiful but again, their effectiveness is largely unknown. Encouraging young people to be involved in community programs is another drug prevention strategy of undecided effectiveness. Interventions that appears to be most effective in relation to countering the use and abuse of illicit substances by youth are those which exert regulatory control; provide opportunities early in life for optimal physical and social development, and undertake early screening to identify those at risk of use and brief interventions if found to be using.

10.4.5 **Sex and unsafe sexual practices**

Engaging in unsafe sex practices has heightened HIV risk as one of the most serious outcomes: thus many of the intervention programs currently being implemented in this area seek specifically to reduce this risk. These programs, essentially educational in nature, have had positive impact on numerous risky behaviours (including having unprotected sex and having multiple sexual partners) – but the results, while statistically significant represent only small changes. Attempts at making program improvements seem to be restricted to changing processes and conditions within an educational context. Different intervention paradigms were not identified.

10.4.6 **Intentional self-harm and suicide**

As with drug use prevention programs, there have been many formulations advising on the structure, content and delivery of self-harm prevention programs, but their effectiveness is essentially unknown.

A systematic review of suicide prevention strategies identified five key categories of interventions:

- *Awareness and education strategies*: These are too often un-evaluated though show limited evidence of being effective in reducing suicide risk and may even have a harmful effect when pitched at a general level. However, there are some guidelines for elements of ‘effective’ national strategies. There is also limited evidence that education programs targeting professionals and care-givers may be more effective.

- *Screening*: Identifying people at risk for suicide attempts and directing them to treatment seems to be effective in identifying those with risk factors for suicide but not in reducing suicide risk.
- *Treatment interventions*: There is limited evidence that such interventions in the form of pharmacotherapy and psychotherapy may be effective in reducing suicide risk, although some forms of psychotherapy could reduce the risk of subsequent suicide attempts by one-half.
- *Access reduction*: Reducing access to the means by which a person may attempt to commit suicide has resulted in fewer suicides by that means. However it remains unclear whether these restrictions reduce suicide risk as a whole.
- *Media suppression*: There is some evidence that suppressing news media about suicide can decrease suicide rates.

Other evidence suggests that the most successful national strategies for preventing suicide, for youth and others, are truly nation-wide in their approach; restrict the access to means of suicide; acknowledge and address how other risk behaviours such as substance use can increase the risk of suicide, and liaise closely with other agencies working in areas that can impact on the risk of suicide.

10.5 **Implications for interventions to improve young driver safety**

Attempts to manage youth risk in other health and social areas have some potential to reduce youth risk taking on the road. The focus of this section is not to identify specific programs that can be lifted and directly applied to the young driver problem. Rather, the focus is on the discussion of general principles gleaned from the non-road area that can be adopted or reinforced in their application to the young driver problem. That said, SDERA's *Keys for Life* program and the *Aussie Optimism Program* (Roberts et al., 2011) are identified as exemplars of local and relevant interventions related to the building of resilience among youth which may impact on young driver risk taking.

10.5.1 **Educational measures**

The review of risk taking interventions has identified that education has been the foundation of initiatives to reduce young people's risk taking across a broad range of behaviours. These programs appear to have had limited effectiveness and nowhere

would this verdict be more accurate than in the context of driving where numerous early education and training programs have consistently failed to produce demonstrable safety benefits. While education interventions proliferate across the different health and social areas where youth demonstrate risky behaviour, and while there are many recommendations relating to the most effective structures, content and processes for these programs, there is a general dearth of supportive empirical evidence. This is not to suggest that a case cannot be made for the role of education in the pursuit of young driver safety.

Given the likelihood that education and training programs will always be relied upon to some extent in road safety, work in other areas has resulted in recommendations relating to the most effective structures, content and processes for educational efforts. For example, Botvin & Griffen (2007) consider the most effective school based educational programs to address substance use and abuse are likely to be, among other things:

- Underpinned by a sound theoretical framework of risk and protective factors.
- Be developmentally appropriate; promote resilience and coping skills; delivered interactively.
- Be delivered in an adequate 'dosage'.
- Involve a strategy for wide dissemination.
- Be comprehensively evaluated.

Added to this would be the requirement that school based education programs link to and complement existing policies, practices, and programs for the behaviour(s) in question. While the extent to which these recommendations have empirical justification is unclear, they generally have high face validity and could represent a framework for designing road safety educational programs.

SDERA's *Keys for Life* pre-learner program is a 'high profile', government funded example of an educational approach that goes beyond the provision of basic road safety knowledge which characterised early youth driver education programs. In a number of respects it satisfies the requirements listed by Botvin & Griffen (2007) for effective school based education. The SDERA program has good face validity as it provides elements of 'insight' training and is founded on resilience education which shows early promise as an effective initiative. It is also founded on a strong base of

evidence related to risk and protective factors for young drivers. The *Keys for Life* program also highlights the importance of obtaining supervised experience beyond that currently legislated and actively engages parents in the supervision and support of learner and novice drivers alike. In this respect the *Keys for Life* program fulfils an important role in supporting and translating the more sophisticated and demanding aspects of contemporary graduated driver training and licensing programs.

In light of the preceding there is good reason to continue the support and expansion of the *Keys for Life* program. There is however, a lack of appropriate research and evidence attesting to the value and effectiveness of the program. Given the profile of the program and the continued push to expand the program State-wide, it is imperative that the pre-driver program be subjected to a considered, extensive evaluation.

The *Aussie Optimism Program* (Roberts et al., 2011) is also relevant to the discussion of education and promotion initiatives that show promise to counter risk taking on the road and the young driver problem more generally. As previously noted, this school based mental health promotion program which focuses on the development of positive social and cognitive skills and relations between parents and children has been found to reduce the use of alcohol immediately post course and both alcohol and tobacco use at 12-month follow-up among Western Australian youth aged 10-13 years. On the strength of these findings there is good reason to consider an expansion of the program to facilitate a large scale evaluation of its impact on young driver outcomes such as crashes and relevant traffic offences.

The strongest conclusion that can be drawn from the review of educational measures and their effectiveness is that educational initiatives that exclusively focus on developing behaviour-specific knowledge and attitudes are unlikely to be effective in isolation of initiatives that focus on the development of broader based personal life skills that equip young people to manage the stresses and pressures of everyday life that can predispose them to risk behaviours.

10.5.2 **Environmental control and social influence**

The inescapable conclusion from the many evaluations of interventions targeting young drivers is that the highest crash reductions will result from those interventions

which directly act upon the environment in which young people drive: for example, the range of restrictions underpinning graduated licensing schemes which encourage young people to be driving under the safest environmental conditions as they gain valuable driving experience. This conclusion is also consistent with the limited evidence available in other health and social areas that environmental controls are likely to have a positive impact on risk behaviour. The regulatory controls over the purchase and consumption of alcohol, tobacco products, illicit and prescription drugs, and gun ownership are relevant examples that attempt to limit the young person's access to means that might enable risk taking behaviour and prove harmful to their health. Discussion of the regulation of access to means in the context of young driver safety necessarily raises the debate around the minimum age of licensure. From a developmental perspective there is good reason to debate an increase in the minimum age of driver licensing or at the very least discuss how to actively encourage young people to delay licensure.

This conclusion is also consistent with the Safe System approach to road safety currently being implemented in Western Australia in the form of *Towards Zero*. Safe System strategies commonly recognise that the individual road user is the weakest link in developing a safe transport system. While road users are always expected to behave responsibly, it is recognised that this will not always be the case, be it through deliberate or inadvertent errors, which may be the case for young drivers as a result of deliberate risk taking or youthful inexperience. Under such circumstances, the driving environment – including the regulatory environment – needs to be structured to provide the maximum protection for all.

As previously elaborated, well-developed graduated licensing schemes provide the strongest and most effective environmental controls for young drivers and risk taking in the early stages of licensure through the many components that restrict and limit novices and young drivers to environmental and social risk factors. It is imperative then that Western Australia's graduated licensing scheme adopts known best practice in this area.

Graduated licensing programs are likely to be maximally effective if reinforced and supported by the broader sociocultural context within which the young driver exists. Part of that context is the influence that peers and parents can have over the

behaviour of young people. These influences were particularly noted in relation to driving, the use and abuse of substances such as tobacco, alcohol, and illicit drugs. There was also some evidence that the quality of relations the young person has with their parents may influence their propensity for self-harm and suicide. The influence of parents and peers on young driver behaviours suggests that the traditional Safe System approach is necessary but less than sufficient for dealing with the various sociocultural factors that can affect young driver behaviour. For this reason then, young driver countermeasures should also, for example, have a stronger focus on:

- Facilitating a positive role for parents in safe driving.
- Limiting the adverse effects of peers while harnessing the ‘power and influence of peers’ to work as effective role models and a source of social support.
- Initiatives to reduce and limit social disadvantage in dealing with the driver licensing system and in other related areas which predisposes youth to risk taking.

10.5.3 **The implementation of universal and co-ordinated strategies**

The conclusions of Martin & Page (2009) in relation to the effectiveness of programs for suicide prevention highlight some useful strategies and processes that could be applied to the young driver problem.

There is some evidence from the area of suicide to show that strategies that are truly national in their focus and co-ordinate well with other supporting initiatives are likely to be most effective. At present there is agreement across Australia in regard to the utility of and general framework of graduated driver training and licensing programs. However, no two State and Territory schemes are alike. A ‘harmonised’ national approach to graduated licensing in respect to both the elements of and timing of the elements would present a clearer, consistent understanding for the community of young driver risks and their countermeasures and thus engender greater acceptance and support for local programs.

A co-ordinated national approach to graduated licensing would also permit a more appropriate comparison across jurisdictions to evaluate local performance. It would also engender an even greater level of co-operation and support across the country than presently exists between authorities and perhaps reduce costs and competition though the sharing of resources and strategies for implementation.

A national strategy to the young driver problem might also ensure that jurisdictions are bound and committed to an evaluation of their front-line strategies, such as graduated licensing programs, to ensure their suitability and need for refinement both in terms of process and content.

The issue of co-ordination between strategies that are ‘complementary’ is also relevant to the young driver problem. Based on Martin & Page’s (2009) review of national suicide strategies, it is apparent there is a need to understand how policies and strategies in other areas, such as alcohol and drug use, impact on driver behaviour and how modifications in these areas can explicitly and specifically impact on driver behaviour. Such information could not be readily identified for this investigation.

10.6 **Recommendations**

Recommendations for policy and practice and for further research are presented in the following sections.

10.6.1 **Policy and practice**

Strengthen the existing Western Australian Graduated Driver Training and Licensing program through the implementation of additional initiatives

A strong argument has been provided around the reasons for and benefits of graduated licensing relative to other initiatives to counter the young driver problem. Western Australia’s graduated driver training and licensing program has undergone a number of changes since the implementation of a relatively weakened version in 2002. That said, there are a number of empirically supported initiatives that could still be implemented to better prepare young drivers for solo driving and to restrict their exposure to risk factors for crash involvement and injury. Some of these initiatives have been considered by the state government and rejected up to now.

Increase the required number of Phase Two hours of supervised driving for learner drivers

Though this review has cited mixed evidence in support of the effects of high levels of supervised driving on novice driver outcomes, by all standards Western Australia's current requirement of 25 hours in the Phase Two learner period (i.e., the six-month period prior to solo driving) is deficient. This was acknowledged by the state government, who subsequently mandated (from November 2012) an additional 25 hours to be completed *prior to* the completion of the Phase One Practical Driving Assessment (for graduation to Phase Two). Despite this change, it is recommended that the Western Australian state government increase the required number of supervised driving hours in Phase Two to 50. This is suggested for two reasons. Firstly, previous research into the experiences of WA learner-drivers in Phase One (see Palamara, 2006c) showed that many were already undertaking a mix of both professional instruction (50% having between seven and 50 lessons) and non-professional supervision (48% having 31 hours or more) and therefore already achieving a good amount of experience *without a requirement to do so*. Secondly, increasing the hours of required experience in Phase Two is considerably better in terms of the proximity and relevance of the skills developed under supervision for use as a solo driver.

Reconsider the introduction of peer passenger restrictions for Provisional drivers

From a developmental perspective peers can unduly influence novice drivers to take risks they might otherwise not take when alone. This point is underscored in relation to driving by the finding that the risk of crashing for novices is significantly elevated when peers are present in the vehicle (Allen & Brown, 2008). The WA state government has previously considered and rejected peer passenger restrictions. It is recommended that the Western Australian state government reconsider restricting the carriage of peer passengers between the hours of 9.00pm and 5.00am for first 6-12 months of the Provisional licence period.

Restrict Provisional drivers from using mobile telephones – hands-free and hand-held – whilst driving

The literature reviewed has shown that novices lack the necessary skill and experience in the early period of licensure and as a consequence have limited spare

capacity to deal with additional non-driving related demands. It was also shown that young and novice drivers frequently use mobile telephones when driving, a distraction that has been associated with an increased risk of crash involvement. It is recommended that the Western Australian state government restrict the use of all mobile phones – hands free and hand held – for the first 6-12 months of the Provisional licence period.

Extend the zero Blood Alcohol Concentration requirement to three years through an extension of the Provisional licensing period

Young and novice drivers have a substantially higher risk of crashing even at very low levels of Blood Alcohol Concentration (BAC). This review has also shown that young drivers are comparatively more likely to be involved in a fatal crash with a BAC level above zero. To decrease the incidence of drink driving in this age, it is recommended that the Western Australian state government extend the required zero BAC level period to 3 years through an extension of the Provisional licensing phase. Such an initiative might have the flow on effect of reducing the very high prevalence of alcohol use among this age group.

Introduce increased demerit point penalties for speeding for Provisional drivers

Speed is a well-known risk behaviour among young drivers, including novices, and a significant risk factor for crash involvement among this group. In their investigation of the relationship between vehicle performance and young driver crash risk, Palamara, Langford, Hutchinson & Anderson (2012) recommended against the introduction of vehicle restrictions for novices to address risky driving and speeding. They instead recommended the introduction of increased demerit point penalties for speeding offences committed by Provisional drivers to a level that would automatically lead to the suspension of a driver under the existing demerit point limits for this licence group. Such a program operates in New South Wales. In support of the recommendation presented by Palamara et al. (2012), this report recommends that the Western Australian state government increase the demerit point penalties for speeding that apply to Provisional drivers to a level that would necessarily and automatically result in the suspension of their licence for any speeding offence during this period.

Introduce an offence/demerit free period as a pre-requisite for graduation through the various phases in the Provisional period and from a Provisional licence to full licence

At present there are no pre-requisites for the graduation of young Western Australian drivers through the Provisional licensing program. To further control the risky behaviour of young drivers it is recommended that the Western Australian state government consider the development of a policy that requires Provisional drivers to maintain an offence/demerit free period (3-6 months for example) for graduation within the Provisional period and from Provisional licence to full licence. This was similarly recommended by Palamara et al. (2012).

Develop a program of community and expert consultation to consider an increase in the minimum Provisional licensing age and other methods to effectively delay licensure

There is little doubt that most adolescents lack development in key areas required for safe driving. In keeping with this conclusion there is good reason to consider if the minimum licensing age should be increased or alternatively how young people can be dissuaded from obtaining a drivers' licence at the minimum age. It is recommended that the Western Australian state government undertake a broad ranging consultation with the community and relevant experts to consider increasing the minimum Provisional licensing age and what other methods might be employed to delay obtaining a licence. These initiatives may provide young people with additional time and maturation to further 'age out' their elevated risk of crash involvement and disposition for aberrant driving.

Support resilience based education and training programs for pre-learner and novice drivers

This review has shown that programs based around resilience training have considerable promise in reducing young driver risk taking and consequently the young driver problem. Two local programs - *Keys for Life* and the *Aussie Optimism Program* – were highlighted as examples of resilience training. While the evidence in support of the effectiveness of these program is respectively lacking and emerging, from a developmental and theoretical perspective these program show promise and should be supported to enable appropriate evaluations of their effectiveness (see the recommendations below for research). It is therefore recommended that the Western Australian state government continue to support *Keys for Life* and the accompanying

programs to reduce alcohol and substance use, and also find opportunities to support a wider-scale implementation of the *Aussie Optimism Program*.

Support initiatives that engage the parents and peers of learner and novice drivers to support safe young driver behaviours

As previously discussed, parents and peers can influence the risk taking behaviours and driving outcomes of youth. The current graduated driver training and licensing program promotes the involvement of parents as supervising drivers to log the required 25 hours (with a proposed increase to 50 hours). The importance of this initiative is reinforced through workshops for parents presented by SDERA trained teachers and RAC WA and should continue to be supported by RAC WA and the Western Australian state government through their funding of SDERA (see also the research recommendation below regarding an evaluation of the *Keys for Life* program). Similarly, programs such as the *Aussie Optimism Program* that seek to develop positive family relations should be supported to ensure that parents and children can easily ‘engage’, not only in the learner driver period but also the early period of licensing when parental control and involvement facilitates positive outcomes for young drivers.

There is also a need to develop mass media and educational campaign material to ‘educate’ parents on the influence they have as ‘driver role models’ for their children even from a very early age. It is recommended that appropriate agencies and groups develop materials and resources that highlight how parents create ‘norms and values’ around acceptable driving behaviour and how these norms and values can adversely or positively influence future young driver behaviour. Recent television campaigns linking the drinking patterns of parents with the future drinking behaviour of their children as adults exemplifies this style of approach and message.

It is also recommended that appropriate agencies and groups explore ways to engage peers to support safe driving behaviours. One example is to develop campaigns to promote positive peer norms for safe driving behaviours along the lines of campaigns which encourage peers to check on the emotional well-being of others (for self-harm and suicide prevention) and others which promote a ‘no smoking’ youth culture.

Development of gender specific mass media campaigns to address problem driving by young males

There is little doubt that relative to young females young males have a considerably higher risk of engaging in risk taking behaviour on the road as well as elsewhere. Campaigns to address this gender issue are often less explicit in the targeting of males preferring instead to ‘imply’ the focus on males through the frequent use of male actors when targeting non-use of seat belts, speeding or drink driving. It is recommended that campaign and resource material be developed that explicitly and without ambiguity target young males to raise awareness of the issue and to promote ways to assist young males to reduce their involvement in risky driving behaviours.

Promotion of a ‘harmonised’ national ‘best practice’ graduated driver training and licensing program

Notwithstanding the many and varied ways in which Australian jurisdictions work together to co-ordinate and promote initiatives to improve road safety, it would appear there has been less success or appetite for the development of a truly uniform national program of graduated driver training and licensing. Jurisdictions such as Victoria and Queensland, who are somewhat more progressed in relation to evaluations of their programs, are in a position to facilitate dialogue on what elements of graduated driver training and licensing elements work best in the Australian context. It is recommended that government agencies and road safety research academics alike work together to develop an Australian version of ‘best practice’ in graduated licensing for wholesale promotion and adoption.

10.6.2 Future research

Undertake a time-series evaluation of the Western Australian graduated driver licensing program

Graduated driver licensing schemes represent a proven, effective intervention. These schemes need to continue to be evaluated, if only to engender further public support for their less popular aspects. Western Australia’s graduated licensing system was introduced in 2002 and has been subject to a number of modifications since then with other changes proposed for implementation in 2012 (e.g., increase in the required hours of supervised driving from 25 to 50; total restriction on the use of mobile phones, handheld and hands-free) and others under review (e.g., restriction on the carriage of peer passengers between 9.00pm-5.00am). To date there has been no

comprehensive evaluation to determine the impact of the system and the many changes on crash and offending behaviour. An evaluation would also allow further refinement of the general conclusion that the more restrictive the conditions, the greater the benefits: licensing authorities need to establish those restrictions that will result in further benefits while loosening any restrictions which have no association with reductions in crashes and offending behaviour.

Investigate the relationship between the driving outcomes of supervising parents and supervised novice drivers

This review has also highlighted the important role of parents and the impact of their driving style and behaviour on the driving outcome of novices. Western Australia's continued promotion of parents and other adults as supervisors or quasi-instructors of learner-drivers highlights the need to investigate the driving history of supervisors and the values and behaviours being transferred in this process. This research would help determine criteria on 'fitness' to supervise and the potential need for supervisors to attend mandatory supervising driver education and training.

Undertake an impact and outcome evaluation of the SDERA *Keys for Life* program

SDERA's *Keys for Life* program has to date been under-evaluated. An evaluation of the program in relation to road safety knowledge and attitudes was concluded in 2006 (Palamara, 2007) and a process/implementation evaluation in 2009 (Quantum Consulting, 2009). However, no other evaluations have been undertaken in relation to the effect of the program on actual hours of supervised driving or other driving outcomes such as traffic offences or crashes.

Undertake an evaluation of the impact of the *Aussie Optimism Program* (AOP) on driving outcomes

In 2006/2007, Roberts et al. (2011) conducted a randomised-control evaluation of the impact of the *AOP* on ~1,700 WA primary school students. Promising findings were reported in relation to a comparatively lower use of alcohol and tobacco by program participants by the time they entered high school. Bearing in mind the relatively small number of study subjects, a follow-up of the participants in relation to various learner-driver and driving outcomes could yield some useful preliminary information on the impact of this mental health promotion program.

Investigate the deterrent effect of penalties on young driver behaviour and associated consequences

There is no recent published evidence in Western Australia of the adequacy of existing penalties to deter risky young driver behaviour. Penalties *should* provide young drivers with a clear understanding of unacceptable driving behaviours. The recent introduction of a reduced demerit point scheme for Provisional drivers underscores this message and effectively means that existing novice drivers can more easily lose their licence. However, there remains a need to understand:

- Young driver perceptions of the likelihood of detection and the severity and impact of the associated penalty.
- The relationship between applied penalties and future driving behaviour (e.g., recidivism).
- The possible unintended impact of the reduced demerit point system, such as unlicensed driving.

Investigate how and what young drivers learn that reduces their risk of crashing

Shope (2010) suggests that one approach to reducing the young driver problem is to understand what novices learn that “...sharply reduces crashing during the initial months of unsupervised driving.” (p. 2). Further to this, there is an associated need to understand *how* young drivers learn this valuable information so that appropriate training and licensing agencies can provide opportunities for learning based on these findings. For example, males continue to represent the larger number of those young drivers who crash and engage in risky driving, and yet, there appears to be no research investigating differences between young male and female drivers in terms of *what they learn* and *how they learn* that reduces their risk of crashing over time.

Develop a program of research to evaluate the impact on young drivers of existing and emerging Safe Systems strategies

There are many aspects of the driving environment which can be further modified to improve young drivers’ safety. Jurisdictions adopting a Safe System strategy are now confronted with a wide variety of speed, road, vehicle and user-related factors that require consideration and analysis – with any subsequent interventions needing close evaluative scrutiny for their impact on young driver safety. The following

exemplifies how Safe Systems initiatives might impact on your driver crashes and injuries.

- Countermeasures to reduce the incidence and severity of injuries resulting from run-off road crashes on curves and bends on rural roads might be particularly beneficial for young drivers who are known to misperceive the hazard associated with such sections of road, often failing to adjust their vehicle's speed and position.
- The promotion of vehicles with a 4 or 5-star crash rating (as per the First Car List or Used Car Safety Ratings) including features such as Electronic Stability Control to reduce loss of control crashes (which are common among young drivers) and multi airbag systems to reduce the severity of injury in the event of a crash could have a significant impact on young driver safety if there is a substantial uptake of these vehicles within the young driver population.
- Intelligent Speed Adaptation systems have the potential to regulate the travel speeds of young drivers who are known for their excessive speeds and over-representation in speed related crashes. Trials should be undertaken to investigate the influence of this technology on young driver speeds.

A program of research should be prepared to specifically investigate how Safe Systems initiatives such as the above might impact on young driver behaviour and crash involvement.

The development of a linked database investigation of the relationship between driving and other problem behaviours among Western Australian youth and young adults

This review has identified a lack of information on the interconnectedness of driving and other problem or health risk behaviours among WA youth. Western Australia's position as a leader in linked health data research presents an opportunity to undertake a population based investigation of the risk factors for driving outcomes using developmental, educational, health, and justice related issues. The Raine Study Birth Cohort with its array of developmental, social, psychological, educational, and health information (from birth to early adulthood) represents a particularly valuable resource and one option for an investigation of the development of on-road and other problem behaviours and their association.

A much larger scale linked database investigation would help elucidate the factors associated with a higher incidence of risk taking and injury among young males and others such as Indigenous persons and those residing in rural communities.

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