



Alcohol-related injury: An evidence-based
literature review

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Alcohol-related injury: An evidence-based literature review

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1.0 Executive summary

Injuries often occur when people have been drinking or are intoxicated. The individual who is drinking and/or intoxicated may be injured, and/or their actions may result in injuries to family members, friends and strangers. Injuries can be accidental; for example from road traffic accidents and falls, or non-accidental; for example, from assault and suicide.

This review focuses on research that considers the role of alcohol in causing injury and the effectiveness of educational and environmental strategies in preventing alcohol-related injury. It should be read in the context of other research on the effectiveness of policies and interventions directed at alcohol-related harm generally, including taxation, regulations, enforcement, and the development of effective treatment services.

Establishing a relationship between alcohol and injury

The extent to which alcohol has a role in the harm that befalls an individual who consumes alcohol, or is affected by someone else's consumption, is challenging to measure. Establishing a causal role means establishing whether the adverse effects would have happened if the individual had not been drinking. Moreover, while alcohol may have a role in some injuries, it may not be the only factor contributing to an injury event.

For most injury types, alcohol's involvement in the injury is likely to be a matter of increased probability rather than certainty. The association between alcohol and injury may just reflect alcohol use being more common among those incurring injuries, for example, young men may engage in more risk-taking behaviours (in addition to consuming alcohol) that may put them at higher risk of injury.

Hospital emergency departments provide a logical location to test the relationship between alcohol and injury (although participants may not be representative of all those with injuries). Emergency department studies have identified an association between a positive BAC (blood alcohol concentration) or self-report of alcohol consumption in the six hours before injury, with admission to the emergency department with an injury.

Estimates of the amount of increased risk vary, with many studies finding an increased risk of injury after consuming alcohol of between 10 and 20 percent. The magnitude of the association between alcohol and injuries in emergency studies is significantly higher for violence-related injuries, and studies show an over-representation of males and young people in the incidence of alcohol-related injury.

Acute intake is more predictive of current injury than the pattern of *general* consumption. However, there is also an association between *chronic* alcohol consumption and injury, with some indication that the risk is highest when an individual is involved in both types of consumption. There is some evidence that repeated injuries may be related more with general consumption patterns than with acute intake, particularly for chronic heavy drinkers.



A dose-response relationship exists between alcohol and injury, with risk increasing with an increasing amount of alcohol consumed in the six hours prior to injury. An increased risk of injury begins at low levels of consumption (as little as one drink a day), although the risk levels off for high levels of consumption. The most common locations for sustaining alcohol-related injuries are public places, private homes and licensed premises.

Alcohol and its relationship to injury from road traffic accidents

Road traffic accidents make up a major component of alcohol-related unintentional injuries, and a causal relationship between alcohol and road traffic injuries has been identified. The risk reduction if no alcohol had been consumed has been estimated at between 11 and 43 percent. There is a dose-response relationship, with the risk of injury increasing non-linearly with increasing alcohol consumption, and an increased risk of injury is apparent at very low levels of alcohol consumption.

Consumption of alcohol by drivers can increase the severity of an accident. Drivers with relatively low BAC drive significantly faster than sober drivers and are significantly less likely to wear seatbelts.

In New Zealand, the overall risk associated with alcohol use by drivers reduces with increasing age. Risks at all BAC levels are significantly higher for drivers aged under 20 years (over five times) and for drivers aged 20 to 29 years (three times), than for drivers aged 30 years and over. Male drivers are more likely to be involved in alcohol-related fatal crashes than females.

It is estimated that around 40 percent of alcohol-related road traffic injuries in New Zealand are injuries to innocent victims (involving the drinking of someone other than the injured person), with most being passengers in cars. The crash risk for pedestrians exponentially increases with increasing blood alcohol concentration, although the risk for pedestrians begins to increase at higher levels of BAC than it does for drivers.

Alcohol and its relationship to injury from falls

Acute alcohol use (within the previous six hours) increases the risk of unintentional falls among young and middle-aged adults, although the magnitude of this risk remains uncertain.

There is inconclusive evidence on any association between *usual* alcohol use and unintentional fall risk resulting in serious injury among young and middle-aged adults. The role of alcohol in falls in older people is also not clear, with alcohol emerging as a risk factor in some individual studies but not identified as a major risk factor in a number of systematic reviews.

Alcohol and its relationship to other unintentional injury

While the scientific evidence points to alcohol being a risk factor for road traffic accidents and falls, there is less evidence available for other areas of injury.

There is substantial, but not definitive, evidence that alcohol plays a role in fire fatalities, and is a particularly important risk factor for fire fatalities and injuries associated with cigarette smoking. The evidence is less clear on minor burn injuries.

One New Zealand study found that alcohol consumption leads to three times the risk of unintentional cutting or piercing injury occurring at home. A dose-response relationship is evident,



with risk increasing with higher levels of drinking. However, all drinkers are at higher risk, not just those who engage in hazardous or dependent drinking.

There is limited robust evidence on the effect of alcohol use on the risk of drowning during recreational aquatic activities, although anecdotal evidence and case series studies strongly support the presumption that alcohol use is a problem. A limited number of studies suggest that the percentage of drowning deaths that can be attributed to alcohol use appears to be in the range of about 10 percent to 30 percent, with the risk of drowning increasing with higher blood alcohol concentration.

While there may be some association between general alcohol use and the likelihood of workplace injury, any association is not particularly strong, and may not be linear. It is possible that alcohol use and the likelihood of workplace injury are both determined by an underlying factor, such as a propensity to engage in risk-taking behaviour.

Alcohol and its relationship to injury from violence

A causal relationship has been established between alcohol and violence from both individual and population-level studies. The relationship between alcohol and injury can be an indirect one – the person who has consumed alcohol may injure someone else (and possibly themselves as well).

The role that alcohol plays in violence is complex and the alcohol consumption of the victim as well as others can impact on the risk of injury. Alcohol-related violence is more closely related to pattern of drinking (i.e. a large quantity of alcohol consumed in a single drinking occasion) than to the overall volume consumed.

There appears to be a small to moderate association between alcohol use/abuse and male to female partner violence and a small association between alcohol use/abuse and female-to male partner violence. Data on men also shows a larger association of alcohol and aggression in clinical (e.g. groups of alcoholics) versus non-clinical groups, and in groups with more severe alcohol problems (e.g. alcohol abuse/dependence and binge/heavy drinking).

More drinking is associated with a higher risk of experiencing suicidal behaviour, with *acute* alcohol use being a key factor, although the effect varies between cultures/countries. Alcohol dependence has also been identified as an important risk factor for suicidal behaviour, with a number of studies finding a high rate of attempted suicide in alcoholics.

Interventions to reduce the risk of alcohol-related injury

Interventions in healthcare settings

A body of evidence has emerged that supports the effectiveness of brief interventions in primary care for reducing alcohol consumption and associated problems for those with hazardous drinking patterns. However, no systematic reviews or meta-analyses were identified that specifically considered the impact of brief interventions in primary care on the incidence of *injury*.



In emergency department settings, brief interventions have been associated with approximately half the odds of experiencing an alcohol-related injury. However, this is based on a small number of studies, and successful outcomes are not inevitable. The reduction in injuries does not appear to occur just as a result of reduced alcohol consumption. There is some evidence that patients who causally attribute their injury to their use of alcohol may be more motivated and likely to change their behaviour.

No clear indication of effectiveness has been found for brief interventions in other hospital settings that aim to reduce future incidence of injury.

Interventions to reduce alcohol-related road traffic accidents

A range of measures to reduce alcohol-related road traffic accidents have been identified as effective or potentially effective, including random breath testing, low or lowered BAC limits, and licensing restrictions.

Education and persuasion through mass media campaigns have been used extensively along with other strategies targeting a reduction in alcohol-related road traffic accidents. There is reasonable evidence to suggest that carefully planned and well-executed mass media campaigns, that attain adequate audience exposure, and are implemented in conjunction with other ongoing prevention activities, can be effective in reducing alcohol-impaired driving and alcohol-related crashes. Such campaigns can be cost saving. Important factors in such campaigns are likely to be message content, message delivery and message pre-testing.

There is insufficient (and conflicting) evidence as to whether brief interventions reduce motor vehicle crashes and related injuries.

Interventions for other settings/injury types

There is no clear evidence that alcohol-testing interventions are more effective than no intervention in reducing injuries in occupational drivers.

There is no clear evidence that school or university-based programmes are effective in reducing alcohol-related injury. However, social norms feedback (e.g. presenting feedback on youth (mis)perceptions about how their peers drink) delivered via the internet or computer, or via individual face-to-face feedback appears to reduce alcohol misuse in university or college students.

There is no clear evidence on the effectiveness of education or training on the dangers of alcohol when on or near the water in reducing the risk of drowning.

No evidence was identified on the effectiveness of education or training on the dangers of alcohol and fire.

There is no clear evidence that server training interventions implemented in alcohol server settings are effective in reducing injury, although mandated interventions may be more likely to show an effect.



Multi-component interventions with community mobilisation

Multi-component programmes have been identified as the approach showing the clearest evidence of effectiveness to date in reducing harm in drinking environments, including violence and traffic crashes.

These programmes combine community mobilisation, responsible beverage service training, house policies and stricter enforcement of licensing laws. Community engagement and mobilisation are important factors in the implementation of such programmes, along with the inclusion of a range of stakeholders, an emphasis on local planning and “ownership”, and prevention strategies designed with long-term institutionalisation in mind.

Findings on multi-component studies are limited by methodological shortcomings. It can also be difficult to separate the effects of the different components of the programme on injury rates. It appears that a comprehensive approach may increase the overall strength of the intervention and provided an environment in which individual strategies can be mutually supportive of one another.

Discussion

A number of clear associations have been made about the relationship between alcohol and injury including the following:

- ◆ There is a clear association between acute alcohol consumption (and also a probable smaller relationship between chronic alcohol use and injury although this has not been clearly defined).
- ◆ There is a dose-response relationship, with the risk of injury increasing as the amount of alcohol consumed increases, although the risk of injury levels off at higher levels of consumption.
- ◆ The risk of injury begins at low levels of consumption.
- ◆ Males and young people are over-represented in the incidence of alcohol-related injury.
- ◆ The magnitude of the relationship between alcohol and violent injuries appears to be significantly higher than for other injury types.
- ◆ A causal relationship has been identified between alcohol and violent injuries, road traffic injuries and injuries from falls, and there is substantial evidence that alcohol plays a role in fire fatalities. The evidence for other injury types is less clear.

However, it is less easy to find answers to some of the more detailed questions asked in the scope of this review. While there is information available on some predictors of injury, such as location of drinking, and levels of intoxication, there is little or no authoritative research on the reasons for drinking, detail on the patterns of drinking, and the length of the risk period after drinking.



The evidence for the effectiveness of interventions to reduce the incidence of alcohol-related injury is also limited. Most of the research has focused on the effectiveness of brief interventions, primarily in the locations where alcohol-related injuries are most likely to be seen – the emergency department.

In emergency department settings, brief interventions have been associated with approximately half the odds of experiencing an alcohol-related injury (no clear evidence has emerged from studies in other hospital settings). However, this is based on a small number of studies and successful outcomes are not inevitable. It is also not clear how any positive effects are mediated as they are not necessarily a product of reduced alcohol consumption. There is some evidence to suggest that patients who causally attribute their injury to their alcohol use might be more motivated to change their behaviour.

Further research has been suggested in areas such as the impacts of brief interventions on different types of injury and different levels of severity of injury, and on factors that influence the efficacy of brief intervention in emergency departments, such as characteristics of the patient, characteristics of the counsellor, characteristics of the intervention and characteristics of the setting.

There was evidence to support the effectiveness of mass media campaigns to reduce alcohol-impaired driving and alcohol-related crashes. However, it is emphasised that such campaigns should be well-planned, well-executed, attain adequate audience exposure and be implemented in conjunction with other ongoing prevention activities, such as enhanced law enforcement.

Multi-component programmes are identified as the approach showing the clearest evidence of effectiveness to date in reducing harm in drinking environments, including violence and traffic crashes. These programmes combine community mobilisation, responsible beverage service training, house policies and stricter enforcement of licensing laws.

There was no information identified for this review on how changed behaviour influences the causal sequence of injuries or the risk of injury.

What is apparent from the literature reviewed is that while there is a broad understanding of the role of alcohol in injury, the mechanics of that relationship are not well understood, and the development of interventions to reduce the impact of alcohol consumption on the incidence of injury is in its infancy.



2.0 Introduction

“Establishing that alcohol consumption is a direct cause of specific social and health problems is a task with great significance for public health. If a social or health problem is at least in part attributable to drinking, the evidence generally helps to suggest specific measures to prevent or control the problem” (Babor, et al., 2010, p. 43).

Injuries often occur when people have been drinking or are intoxicated. The individual who is drinking and/or intoxicated may be injured, and/or their actions may result in injuries to family members, friends and strangers. Injuries can be accidental; for example from road traffic accidents and falls, or non-accidental; for example, from assault and suicide.

The World Health Organization (2011) estimates that approximately four and a half percent of the global burden of disease and injury is attributable to alcohol. “Alcohol consumption is estimated to cause from 20% to 50% of cirrhosis of the liver, epilepsy, poisonings, road traffic accidents, violence and several types of cancer” (p. 20)¹.

The *New Zealand Injury Prevention Strategy* (Dyson, 2003), launched in 2003, establishes a framework for the injury prevention activities of government agencies, local government, non-government organisations, communities, and individuals. The development of the *Strategy* was led by ACC in consultation with individuals and organisations throughout New Zealand, and in partnership with the Ministries of Health, Labour, Transport, Social Development, and Justice.

The *Strategy* focuses on six priority areas that account for at least 80 percent of serious injuries and injury deaths: motor vehicle traffic (road) crashes, suicide and deliberate self-harm, falls, workplace injuries, drowning and assault. A five-year evaluation shows the *Strategy* has created “... a foundation for future work to further reduce injuries and ultimately reduce the costs associated with them” (New Zealand Injury Prevention Strategy Secretariat, 2010, p. 1). The evaluation report shows that, overall, injury-related deaths have decreased, specifically in areas such as road crashes and workplace injuries, and attributes this to sustained activity and investment in injury prevention over a period of time.

However, the evaluation of the *Strategy* also highlighted the need for an integrated, cross-agency focus in the areas of child injury, alcohol, Māori, and community engagement, as these areas currently face challenges in terms of leadership and coordination. One of the recommendations of the evaluation was to support and monitor the inclusion of specific actions in the plans of lead agencies (ALAC, the Ministry of Justice and the Ministry of Health) to address alcohol as a causal factor for injury.

¹ Most percentages reported in this review have been rounded, unless it is felt that this affects the clarity of the points made.



In 2010, recommendations from the evaluation were considered by the Injury Prevention Ministerial Committee, and alcohol-related issues were prioritised for initial action². After consultation with other agencies and with the Associate Minister for ACC, ACC took responsibility for leading the alcohol-related injury focus area. In the *New Zealand Injury Prevention Outcomes Report – June 2011*, it is noted that ACC's lead in this area will contribute to and enhance work already being undertaken by other agencies (New Zealand Injury Prevention Strategy Secretariat, 2011).

This review focuses on research that specifically considers the role of alcohol in causing injury and the effectiveness of educational and environmental strategies in preventing alcohol-related injury. It should be read in the context of other research on the effectiveness of policies and interventions directed at alcohol-related harm generally, including taxation, regulations, enforcement, and the development of effective treatment services.

As ACC requested a *rapid response* evidence-based review of the literature, the emphasis has been on identifying meta-analyses and systematic reviews that address the scope of this review, along with relevant New Zealand research and other authoritative research relevant to a New Zealand context.

This review aims to provide a clear overview of the state of current research, and enable strengths and gaps in the current evidence base to be identified.

Part A of the review identifies research on the relationship between alcohol and injury, including the impact of alcohol on different types of injury.

Part B identifies research on best-practice interventions that aim to reduce the incidence of alcohol-related injury.

Appendix 1 provides an overview of key information sources on the relationship between alcohol and injury. Appendix 2 provides references for the research described in this review.

² Unintentional injuries to children were also prioritised.



3.0 Methodology

3.1 Scope

The primary purpose of this evidence-based literature review of alcohol-related injury is to help ACC understand the contributing role that alcohol plays in injury, in order to inform the development of appropriate and targeted policies and interventions. The focus of the review is on injury to the drinker or other parties, rather than other alcohol-related harms (e.g. health outcomes).

In undertaking the review, the aim was to answer the following questions:

1. What is the evidence for the following as predictors of injury and what is their relationship with types of injury:
 - ◆ Location of drinking (environment, place of last drink, scene of accident)
 - ◆ Reasons for drinking (triggers, motivation, who they drink with)
 - ◆ Type of drinker (binge drinkers, demographic groups)
 - ◆ Patterns of drinking (when they drink, time of day, season, frequency, numbers and types of drinks)
 - ◆ Levels of intoxication (maximum drinking, binge drinking, moderate drinking, hazardous drinking)
 - ◆ Length of risk period after drinking.
2. What evidence is there to support different methods/interventions to change behaviour and how successful are they?
3. What is the evidence that changed behaviour influences the causal sequence of injuries or the risk of injury?

The focus of the review is on relevant material published since 2007 (the last five years). However, a significant amount of earlier widely cited research is included, where it facilitates comparison and assessment. Because of the limited timeframe for completion of this review, the focus has been on sourcing meta-analyses and systematic reviews and other quality research that will contribute to the development of appropriate policies and interventions for a New Zealand context.

In the summary points at the beginning of each section, two main research types are highlighted:

- ◆ **Authoritative research.** Research that can be applied with confidence to a New Zealand context, and is widely known, respected and considered as reliable; for example, meta-analyses and systematic reviews. This research will be supported by empirical evidence,



will use rigorous methodologies, and is likely to be commonly cited in peer-reviewed research.

- ◆ **Indicative research.** Single pieces of quality research that provide important insights for a New Zealand context, but may not be able to be applied with confidence without further exploration or additional studies.

These research types are a guide only. However, they do provide a useful way in which to assess strengths and gaps in current knowledge about the relationships between alcohol and injury, and about the effectiveness of interventions in reducing the risk of injury. The emphasis of this review in terms of interventions is on educational and environmental approaches. The scope does not include enforcement or specialised treatment for those with alcohol dependence.

3.2 Search strategy

Literature search

The literature search took the following approach:

1. Literature searches were conducted by the ALAC librarian and the information managers and librarians of Research New Zealand. Databases searched included (but were not limited to):
 - ◆ EBSCO SocIndex
 - ◆ Electronic Journals Service
 - ◆ Masterfile Premier
 - ◆ Gale Onefile
 - ◆ ALAC Library Catalogue - <http://www.alac.org.nz>
 - ◆ Drug and Alcohol Findings (UK) - <http://findings.org.uk/>
 - ◆ Informa Healthcare - <http://informahealthcare.com/search/simple>
 - ◆ IPLit database - <http://iplit.fmhs.auckland.ac.nz/>
 - ◆ IP Online - <http://injuryprevention.bmj.com/>
 - ◆ SafetyLit - <http://www.safetylit.org>
 - ◆ Te Puna National Bibliographic Database - <http://www.natlib.govt.nz/catalogues/te-puna-search>
 - ◆ Google Scholar - <http://scholar.google.co.nz>



Keywords/search terms used included: Alcohol* / liquor* / injur* / binge drinking / wound* / accident* / trauma / predictor / intervention / initiative / setting / evaluation / Māori / Pacific / Zealand; Canada; Australia; UK.

2. A search of the websites of research organisations, academic research units and government departments was carried out. Sites searched included (but were not limited to):

New Zealand

- ◆ ACC - <http://www.acc.govt.nz>
- ◆ Addiction Research Network, University of Auckland - <http://www.fmhs.auckland.ac.nz/faculty/arn/>
- ◆ ALAC – <http://www.alac.org.nz>
- ◆ Alcohol Drug Association - <http://www.adanz.org.nz>
- ◆ Auckland City Council - <http://www.aucklandcity.govt.nz>
- ◆ Auckland District Health Board - <http://www.adhb.govt.nz/>
- ◆ Best Outcomes for Māori Te Hoe Nuku Roa - <http://www.tehoenukuroa.org.nz/index.htm>
- ◆ Canterbury District Health Board - <http://www.cdhb.govt.nz>
- ◆ Capital & Coast District Health Board - <http://www.ccdhb.org.nz>
- ◆ Centre for Social and Health Outcomes Research and Evaluation (SHORE) / Te Ropu Whariki - <http://www.shore.ac.nz> / <http://www.whariki.ac.nz/>
- ◆ Christchurch City Council - <http://www.ccc.govt.nz>
- ◆ Christchurch Health and Development Study - <http://www.chmeds.ac.nz/research/chds/index.htm>
- ◆ Clinical Research and Resource Centre (Waitemata District Health Board) - <http://www.crrc.co.nz>
- ◆ Coronial Services of New Zealand <http://www.justice.govt.nz/courts/coroners-court>
- ◆ Counties Manukau District Health Board - <http://www.cmdhb.org.nz>
- ◆ Department of Corrections - <http://www.corrections.govt.nz>
- ◆ Dunedin City Council - <http://www.dunedin.govt.nz>



- ◆ Dunedin Multidisciplinary Health and Development Research Unit - <http://dunedinstudy.otago.ac.nz/>
- ◆ Families Commission - <http://www.nzfamilies.org.nz/>
- ◆ Gambling and Addictions Research Centre, AUT University - <http://www.aut.ac.nz/research/research-institutes/nipmhr/gambling-and-addictions-research-centre>
- ◆ Health Research Council - <http://www.hrc.govt.nz>
- ◆ Health Sponsorship Council - <http://www.hsc.org.nz>
- ◆ Injury Prevention Information Centre (including Injury Literature Database) - <http://www.fmhs.auckland.ac.nz/soph/centres/ipic/>
- ◆ Injury Prevention Research Unit - <http://www.otago.ac.nz/ipru/home.html>
- ◆ Lakes District Health Board - <http://www.lakesdhb.govt.nz>
- ◆ Manukau City Council - <http://www.manukau.govt.nz/>
- ◆ Maritime New Zealand - <http://www.maritimenz.govt.nz>
- ◆ Ministry of Health - <http://www.moh.govt.nz>
- ◆ Ministry of Justice - <http://www.justice.govt.nz>
- ◆ Ministry of Transport - <http://www.transport.govt.nz>
- ◆ Ministry of Youth Development - <http://www.myd.govt.nz>
- ◆ National Addiction Centre - <http://www.chmeds.ac.nz/departments/psychmed/treatment/index.html>
- ◆ Nelson Marlborough District Health Board - <http://www.nmdhb.govt.nz>
- ◆ New Zealand Drug Foundation - <http://www.nzdf.org.nz>
- ◆ New Zealand Fire Service - <http://www.fire.org.nz>
- ◆ New Zealand Police - <http://www.police.govt.nz>
- ◆ Otago District Health Board - <http://www.otagodhb.govt.nz>
- ◆ Platform Charitable Trust - <http://www.platform.org.nz>



- ◆ Safe Communities Foundation - <http://www.safecommunities.org.nz/>
- ◆ Te Pou: National Centre of Mental Health Research, Information and Workforce Development - <http://www.tepou.co.nz>
- ◆ Waitakere City Council - <http://www.waitakere.govt.nz>
- ◆ Water Safety New Zealand - <http://www.watersafety.org.nz>
- ◆ Wellington City Council - <http://www.wellington.govt.nz>
- ◆ Youth 2000 - <http://www.youth2000.ac.nz>

International

- ◆ Cochrane Library - <http://www.thecochranelibrary.com>
- ◆ Healthy Nightlife Toolbox - <http://www.hnt-info.eu>
- ◆ HPS Network (Canada) - <http://hpclearinghouse.net>
- ◆ Drug and Alcohol Findings (UK) - <http://findings.org.uk/>
- ◆ Journal of Trauma - Injury Infection & Critical Care - <http://journals.lww.com/jtrauma/pages/default.aspx>
- ◆ Liverpool John Moores University (Faculty of Health and Applied Social Sciences) - <http://www.cph.org.uk/teams.aspx>
- ◆ Ontario Injury Prevention Resource Centre - <http://www.oninjuryresources.ca/>
- ◆ World Health Organization - <http://www.who.int>

3. The reference lists of items found in the initial literature search were checked to identify any additional relevant references.



3.3 Search results

A substantial amount of research has been reviewed for this project. As this is a rapid response exercise, in a few cases we have not accessed the full text version of journal articles where the key points were clear in the abstract. Where this is the case, [Abstract] is added to the reference.

Brief details are given on the methodology for each study described in the review. Readers should access the original report for full details on methodology and design³.

³ For details on the process of preparing and maintaining Cochrane systematic reviews, go to:
<http://www.cochrane.org/training/cochrane-handbook>



4.0 Glossary

The glossary below defines how this review uses a number of terms.

Alcohol consumption	The frequency with which alcohol is consumed and/or the quantity consumed over a given time.
Alcohol dependence syndrome	A cluster of cognitive, behavioural and physiological symptoms signifying the importance of alcohol consumption in the life of the drinker (e.g. a tendency for drinking patterns to become fixed, alcohol playing an increasingly central role in the life of the drinker relative to other life tasks and challenges, increased tolerance to alcohol, withdrawal symptoms upon cessation or reduction of alcohol intake, drinking to escape from or avoid withdrawal symptoms). A diagnosis of dependence should only be made if three or more of the symptoms have been experienced or exhibited within the last 12 months.
Alcohol-related harm	A variety of negative life events that are the direct result of alcohol consumption. This can include effects on physical or mental health (including injury), and social and legal problems. It can also encompass harm to society, such as costs to the medical system, crime and drink driving, and secondary effects, such as the impact on families.
BAC	Blood alcohol concentration (BAC) or blood alcohol content is usually used as a measure of alcohol intoxication. BAC is usually expressed as the amount of alcohol in a given amount of blood. It is often measured as either grams of alcohol per deciliter of blood (g/dl), milligrams per deciliter (mg/dL), or milligrams of alcohol per milliliters of blood ⁴ .
Binge drinking/heavy episodic drinking	Consumption of large quantities of alcohol during a single drinking occasion or 'session'.
Brief intervention	Aims to identify a real or potential problem (e.g. with alcohol use) and motivate an individual to do something about it. Approaches to brief interventions can include health education, self-management training, group therapy, social skills training, simple advice (in person or through self-help guides), and motivational interviewing. Brief interventions can be delivered by specialists or non-specialists, and may range in duration from one five-minute session to several sessions.

⁴ For more information, see

<http://www.icap.org/PolicyTools/ICAPBlueBook/BlueBookModules/16BloodAlcoholConcentrationLimits/tabid/176/Default.aspx>



Disability-adjusted life-years, (DALYs)	A measure of population health. DALYs combine years of life lost due to premature death and years of life lived with disabilities into one indicator that assesses the total lost years of full health from different causes.
Hazardous drinking drinkers	Alcohol consumption that could cause one or more physical, mental or social problems for the drinker or others, but does not meet the criteria for dependence.
Screening	<p>Screening and assessment to identify candidates for brief intervention for alcohol problems can range from short structured interviews that contain questions on the quantity and frequency of drinking to in-depth assessment of a broad range of psychosocial functioning.</p> <p>The Alcohol Use Disorders Identification Test (AUDIT) is one of the most widely used screening questionnaires to enable early detection of individuals displaying harmful alcohol consumption. It is based on a ten-item questionnaire covering alcohol consumption, drinking behaviour and alcohol-related problems.</p>



PART A: The relationship between alcohol and injury

This part of the review identifies research on the relationship between alcohol and injury, including the impact of alcohol on different types of injury.



5.0 Measuring the relationship between alcohol and harm

“Whereas a substantial amount of literature exists reporting the association of alcohol and injuries, causal associations are less well established” (World Health Organization, 2007, p. 2).

5.1 Alcohol and harm

Alcohol intoxication can result in psychomotor impairment, lengthened reaction time, impairment of judgement, emotional changes, and decreased responsiveness to social expectations (Babor, et al., 2010).

Babor and colleagues identify three main aspects of alcohol that contribute to harms as a result of drinking: the toxic effect (that primarily impacts on chronic diseases), drinking in a specific event, including intoxication (primarily impacts on injuries), and dependence (due to its probable role in contributing to high volume and excessive patterns of consumption). There can be significant differences in drinking patterns between countries, genders, age groups, and between ethnic groups. For example, Babor and colleagues note that overall men drink heavily much more often than women and that intoxication is a marked characteristic of drinking by adolescents and young adults in many cultures.

The extent to which alcohol has a role in the harm that befalls an individual who consumes alcohol, or is affected by someone else's consumption, is challenging to measure. Establishing a causal role means establishing whether the adverse effects would have happened if the individual had not been drinking. Moreover, while alcohol may have a role in some injuries, it may not be the only factor contributing to an injury event (Babor, et al., 2010; Rehm, et al., 2004).

Researchers often use data from a range of countries to examine the links between alcohol and injury. Babor and colleagues point to advances in international efforts to use standard codes for causes of *death* from disease, such as the International Classification of Disease, Tenth Revision (ICD-10), and go on to say that comparative studies, such as the *Global Burden of Disease Study* “correct for cultural differences in coding practices” (p. 44). However, they suggest that an element of social definition is still present in the identification of alcohol-related harms. They also identify a lack of cross-nationally comparable data on disabilities and *morbidity*, which is particularly challenging when research points to alcohol being more related to disability than to mortality.

The World Health Organization (2011) describes population-attributable fractions as “the proportional reduction in population disease or mortality that would occur if exposure to a risk factor were reduced to an alternative exposure scenario (e.g. no alcohol use)” (p. 23). The attributable fraction represents the proportion of cause of death or other adverse condition that is attributable to a particular risk factor, regardless of whether or not the factor can be causally implicated in particular deaths or adverse events. Room and Russow (2001) note that, “[t]he policy question behind the attributable fraction concept is: if a certain fraction of consumption, or of high-



risk drinking occasions, could be taken away, how much would the rates of the adverse events fall?”.

Some conditions are *alcohol-specific*, where alcohol is causally implicated in all cases of the condition, such as alcoholic liver cirrhosis and alcohol poisoning (the attributable fraction will always be one because no cases would arise in the absence of alcohol). More than 30 ICD-10 codes include alcohol in their name or definition, indicating that alcohol consumption is a necessary cause (Babor, et al., 2010; World Health Organization, 2011).

On the other hand, *alcohol-related* conditions include not only alcohol-specific conditions, but also conditions where alcohol is causally implicated in some, but not all, cases of the condition (where the attributable fraction will range between greater than zero and less than one). Alcohol may be one among a number of components, none of which alone is sufficient to cause the condition. The condition may have taken place even if alcohol had not been consumed. Alcohol has been identified as a component cause for over 200 ICD-10 diseases, including pancreatitis, liver cancer and breast cancers. It has also been identified as a component cause for suicide and violence, and some unintentional injuries (Babor, et al., 2010; Room & Russow, 2001; World Health Organization, 2011).

5.2 Alcohol and injury

For most injury types, alcohol's involvement in the injury is likely to be a matter of increased probability rather than certainty (Babor, et al., 2010). The association between alcohol and injury may just reflect alcohol use being more common among those incurring injuries, for example, young men may engage in more risk-taking behaviours (in addition to consuming alcohol) that may put them at higher risk of injury. Rehm and colleagues (2009, p. 2226) note that establishing causality requires “... sufficient evidence of: a consistent association (positive or negative) between alcohol consumption and the disease or injury; chance, confounding variables, and other bias being ruled out with reasonable confidence as factors for association; and evidence of a plausible mediating process”.

To understand alcohol's role in particular injury types (unintentional and intentional), researchers use epidemiological studies to estimate relative risks, that is, how much particular levels and patterns of alcohol consumption increase the risk of mortality or morbidity. The attributable fraction can be calculated based on information on relative risk combined with prevalence data (Babor, et al., 2010). Babor and colleagues note that “... if the results from individual- and population-level studies point in the same direction, our confidence in the findings is increased substantially ... But if the results do not point in the same direction, judgments must be made about the relative weight of evidence from the different studies” (Babor, et al., 2010, p. 48).

In order to study alcohol's *harm to others*, researchers can use a number of measurements, including the fact of the occurrence or death or a respondent's report of an adverse event that may include detail on the severity of the event and the frequency of similar events (Room, et al., 2010).



6.0 Alcohol and its relationship to injury

“These metrics of harm and means of assessing causality have a substantial base in the research literature but all are the subject of continuing debate and discussion, as scientists continue to endeavour to improve concepts and measurement”. (Laslett, et al., 2010, p. 12).

SUMMARY

Authoritative research

There is an association between a positive BAC or self-report of alcohol consumption in the six hours before injury, with admission to the emergency department with an injury. Acute intake is more predictive of current injury than the pattern of general consumption.

Estimates of the amount of increased risk vary, with many studies finding an increased risk of injury after consuming alcohol of between 10 and 20 percent.

A mix of injury types can obscure differences in the relationship between alcohol and the various forms of injury and between demographic groups.

The magnitude of the association between alcohol and injuries in emergency studies is significantly higher for violence-related injuries.

While the *acute* use of alcohol is the consumption pattern most associated with injury, there is also an association between *chronic* alcohol consumption and injury, with some indication that the risk is highest when an individual is involved in both types of consumption.

Studies show an over-representation of males and young people in the incidence of alcohol-related injury.

There is a dose-response relationship between alcohol and injury, with risk increasing with an increasing amount of alcohol consumed in the six hours prior to injury. An increased risk of injury begins at low levels of consumption (as little as one drink a day), although the risk levels off for high levels of consumption.

The most common locations for sustaining alcohol-related injuries are public places, private homes and licensed premises.

In emergency department studies, participants may not be representative of all those with injuries as some people with injuries will not seek medical attention or will present at primary care facilities.

Indicative research

Contextual factors appear to lead to different levels of alcohol-related harm in different counties/cultures. These factors might include differences in harm minimisation policies, per capita consumption, and the level of stigmatization of alcohol use.

Repeated injuries may be related more with general consumption patterns than with acute intake, particularly for chronic heavy drinkers.

The increased risk of alcohol-related injury for young people is likely to be related to the binge drinking more often occurring in this age group.

Early initiation into drinking has been linked to higher levels of alcohol-related injury, particularly road traffic and violence-related injuries.

Greater proportions of Pacific peoples in New Zealand report violence and injury from other peoples' drinking, and greater proportions report problems from violence and serious arguments as a result of their own drinking compared with the general New Zealand population.



6.1 The impact of alcohol on different types of injury

The World Health Organization (2011) identifies two different injury categories that have been causally linked to alcohol:

- ◆ Intentional injuries: alcohol consumption, especially heavy drinking, has been linked to suicide and violence (see Table 1).
- ◆ Unintentional injuries: almost all categories of unintentional injury are impacted by alcohol consumption. There is a strong link to the level of alcohol concentration in the blood and the resulting effects on psychomotor abilities, and higher levels of alcohol consumption create an exponential risk increase. Unintentional injuries can include road traffic accidents, falls, drowning, poisoning and other unintentional injuries (see Table 1).

The World Health Organization (2011) provides data on global alcohol-attributable deaths⁵. Of all alcohol-attributable deaths globally, they identify 12 percent as being a result of intentional injuries and 29.6 percent being a result of unintentional injuries (in total, 42% of all alcohol-attributable deaths). More specifically they describe the injury types listed in Table 1 as a percentage of global alcohol-attributable deaths, and they provide alcohol-attributable fractions.

Table 1 Distribution of global alcohol-attributable deaths, and population-attributable fractions by injury type (World Health Organization, 2011)⁶.

Injury	Distribution of alcohol-attributable deaths (%)	Population-attributable fractions (%)
Road traffic accidents	11.9	21.0
Other unintentional injuries	9.9	19.2
Violence	8.0	30.1
Self-inflicted injuries	4.0	10.7
Poisonings	3.0	19.2
Drownings	2.7	15.7
Falls	2.1	11.2

While global data on injury is presented above, sections 7.0 to 10.0 describe international research, applicable to a New Zealand context, which discusses what is known about the relationship between alcohol consumption and different injury types.

⁵ Based on 2004 data.

⁶ Other data included in the *Global status report on alcohol and health* includes the alcohol-attributable burden of disease by disability-adjusted life years.



6.2 Testing the relationship between alcohol and injury

6.2.1 Emergency department studies

Hospital emergency departments provide a logical location to test the relationship between alcohol and injury. Case-control and case-crossover studies in addition to population-level studies (i.e. what happens if there is a change in alcohol consumption etc) are widely used for establishing the relationship between alcohol and injury. In case-control studies, drinking prior to injury among cases is compared with drinking at a particular time by members of a control group who are not injured (in emergency department studies this is usually patients attending with medical conditions). In a case-crossover design, alcohol consumption by an individual before their injury is compared with their own drinking during a pre-determined previous time period, or compared with their usual alcohol consumption (Babor, et al., 2010; Ye & Cherpitel, 2009).

Alcohol use is generally measured by blood alcohol concentration (BAC) or patient self-report of alcohol consumption in a period of time leading up to the injury (or up to first noticing their medical condition for those in the control group) (Ye & Cherpitel, 2009).

In most studies reviewed in this report, an alcohol-related injury was determined from a positive self-report of alcohol consumption in the six hours prior to the occurrence of an injury, or by a positive blood alcohol analysis. Cherpitel and colleagues (2003, *cited in* Ye & Cherpitel, 2009) describe the six-hour timeframe as providing a more valid BAC measure. Humphrey and colleagues (2003) note that few studies have investigated injuries occurring more than six hours previously and, for this reason, the number of alcohol-related injuries may be greater than that identified in research studies.

A cross-national meta-analysis of the relationship between alcohol and injury combined data from 12 emergency department studies across five countries that used similar controls and methodologies (Cherpitel, et al., 2003, *cited in* Ye & Cherpitel, 2009). When the authors restricted analysis to those arriving in the emergency department within six hours of the event, and after controlling for age, gender and drinking five or more drinks on an occasion at least monthly, those with a positive BAC or self-reported consumption were half as likely again to be admitted to the emergency department with an injury compared to a medical problem. Effect sizes were homogeneous across emergency departments for BAC, but not for self-report⁷. The authors conclude that there is a “moderate, but robust association of a positive BAC and self-report with admission to the ER with an injury”. They also point to “contextual variables” across different cultures playing a role in the alcohol-injury relationship.

A further meta-analysis of data from the same project (the *Emergency Room Collaborative Alcohol Analysis Project*) was based on data from 17,708 participants in emergency department studies from seven countries, and compared injured patients with non-injured patients (Cherpitel, et al., 2005). This analysis found that when *all types* of injuries were combined, both alcohol

⁷ The authors note that “only when an individual arrives at the ER shortly after injury and reports drinking shortly before the injury would the two measures be expected to be similar” (p. 1278).



consumption before an injury event and usual consumption pattern contributed only a relatively modest amount to injury occurrences, particularly for women (effect sizes were not homogeneous across studies). There were also few differences between older and younger age groups, which the authors suggest could be explained by the mix of injury types and causes obscuring any age differences.

However, Cherpitel and colleagues also report “... substantially larger attributable risk effect sizes ... for violence-related than for all-cause injuries, especially in the case of men, among whom risk levels reached 43% for those reporting consumption of alcohol before the injury event” (p. 269) (for women the risk was 12% with a positive blood alcohol concentration). The authors also suggest which contextual variables might result in different findings for different drinking cultures, including per capita consumption and a country’s level of stigmatization of alcohol use. “Those societies in which alcohol use is less integrated and in which stigmatization of alcohol use is higher are also those in which alcohol is consumed in a more explosive manner, leading to violence-related events” (p. 271).

A systematic review of emergency department studies, published between 1995 and 2005 and focused on the association between alcohol and injuries, also found that injured patients were more likely to be positive for BAC at the time they were admitted and to report drinking within six hours prior to the injury event, compared with those who were not reporting with injuries (Cherpitel, 2007). Again, the magnitude of this association was significantly increased where the injury was violence-related. There was a smaller association of indicators of alcohol use disorders with injury. The author notes that this raises the question of whether the acute use of alcohol is a “more important predictor of injury than chronic use of usual drinking patterns” (Cherpitel, 2007, p. 211)

The World Health Organization (2007) also refer to the large number of studies carried out in emergency departments around the world, and suggest that the combined evidence from these studies, as well as national epidemiological studies, indicates that 10 to 18 percent of injured patients attending emergency departments are alcohol-related cases, with many showing an over-representation of young people and males.

WHO Collaborative Study on Alcohol and Injuries

The World Health Organization *Collaborative Study on Alcohol and Injuries* (World Health Organization, 2007) investigated the role of alcohol involvement in *non-fatal* injuries among emergency department attendees in 12 developed and developing countries around the world (including New Zealand). Across all the countries, the data from over 5,000 participants was analysed.

A case-crossover methodology was used by ten of the participating study centres to assess the magnitude of the association between alcohol and injury. Data collection methods included BAC collection, clinical observational assessment, and an interviewer-led questionnaire.



The results showed that acute alcohol use was associated with injuries in all sites (with the exception of Canada and the Czech Republic⁸). The study found a *combined* proportion of alcohol-involved injury cases for all countries of 20 percent (New Zealand 35%) - slightly higher than the 10 to 18 percent found in other international studies.

The authors note that differences in alcohol-involved injury rates between countries probably reflects differences in patterns of alcohol consumption within each country, cultural differences and differences in the existence and levels of alcohol harm minimisation policies (e.g. age restrictions for alcohol purchase and drink driving legislation). The authors emphasise that in emergency department studies, cases may not be representative of all those with injuries, as some individuals will not seek medical attention or will present at primary care facilities.

The New Zealand study that contributed to the *Collaborative Study on Alcohol and Injuries* provides additional detail (Humphrey, et al., 2003). The study was undertaken in an emergency department in Auckland in December 2000. The authors note that, up to that point, there had been no investigations of alcohol involvement in patients with an injury presenting to an emergency department in New Zealand.

The study used a case-crossover design, with a random sample of patients interviewed and breath tested over a three-week period. Of the 166 injured patients who completed all the procedures, 35 percent reported consuming alcohol prior to sustaining their injury, with males (two-thirds of all injury presentations) and the under 30 years age group (two-thirds of injuries) over-represented in both alcohol-related and non alcohol-related injury cases. The authors found that the risk of sustaining an injury was 2.8 times greater when alcohol was consumed. Other findings of interest include the following:

- ◆ There were no differences between the quantity of alcohol consumed by males and females or younger and older participants.
- ◆ Alcohol-related injury cases were significantly more likely to be assessed as serious (based on triage codes).
- ◆ Cuts and bruises were the most common alcohol-related injuries (for non alcohol-related injuries, it was cuts, bruises and sprains).
- ◆ Violence was the cause of 17 percent of injury cases and alcohol was reported as involved (victim and/or perpetrator) in 79 percent of these cases.

In the New Zealand study, data was collected over the Christmas celebration period. The World Health Organization (2007) notes that participants in the New Zealand study drank more than their typical amount in the six hours before the injury, and that this emphasises the importance of future research taking into account seasonal patterns in alcohol consumption (World Health Organization, 2007).

⁸ The authors note the need for additional analysis to explain the reason for this exclusion.



6.2.2 Other New Zealand research

In a local study, alcohol-related injury presentations to Hawke's Bay Regional Hospital were measured in 2008/2009⁹, based on all first attendance injury presentations within 48 hours of injury (including children) from the 1 to 28 May 2008 and from 8 December 2008 to 4 January 2009 (McElnay, 2009). Data collected included clinical observations¹⁰, injury details and diagnosis, likelihood of alcohol contributing to injury, and alcohol consumption (self-report). Missing data were sourced from medical records and ACC forms.

McElnay found that, in May 2008, 18.2 percent of cases were alcohol-related, rising to 24.6 percent in the December /January period. A high proportion of patients with alcohol-related injuries were Māori (compared to the Hawke's Bay population). The author reports a seasonal impact for Pacific people, who made up 10 percent of alcohol-related injuries in May and 1.4 percent in December (they make up 3.2% of the Hawke's Bay population). The predominant mechanism of alcohol-related injuries was assaults and the most common place where alcohol-related injury occurred was at home or in a private residence.

In 2002, Coggan and colleagues argued that hospitalisation data may not provide a complete picture of injury rates in New Zealand. They undertook a cross-sectional survey of 5,285 households in New Zealand (approximately 400 randomly selected households from each of 13 territorial local authorities). While 41 percent of households reported that someone in the household sustained an injury, only eight percent of the injuries required overnight hospitalisation.

Another New Zealand study by Connor and colleagues (2005) used a comparative risk assessment methodology developed by the World Health Organisation to estimate the burden of death, disease and disability attributable to alcohol consumption in New Zealand. Epidemiological research and survey data were combined with the estimates of alcohol-disease relationships to calculate how much of each alcohol-related condition was attributable to alcohol¹¹ (Connor, et al., 2004b). Connor and colleagues (2005) conclude that injury was a major contributor to alcohol-related mortality in 2000, being responsible for "... half of all alcohol-attributable deaths and almost three-quarters of the years of life lost due to alcohol" (p. 57).

In a study based on self-reporting, participants in the New Zealand *Alcohol and Drug Use Survey* were asked if they had ever experienced an injury because of their alcohol use (Ministry of Health, 2009). Overall, just under five percent of adults aged 16 to 64 years had experienced an injury in the past year due to their alcohol use. This was 5.5 percent of all participants who had consumed alcohol in the last year.

The prevalence of having had injuries due to their own alcohol use in the last year was highest among those aged 16 to 24 years, with 15 percent of people aged 16 to 17 years reporting an injury due to their drinking. Men (7.2%) were significantly more likely to have experienced an injury

⁹ This was baseline data collection to inform the local CARV (Curbing Alcohol-Related Crime) project. Project CARV is a two year demonstration project aiming to reduce alcohol-related violence in three areas: Rotorua; Hastings/Napier; Queenstown.

¹⁰ Based on an Alco-Link guide to assessing the extent to which a person is affected by alcohol.

¹¹ Estimates of the disability-adjusted life years lost for each condition in New Zealand in 2002 were obtained from the *Global Burden of Disease Study*. The *Global Burden of Disease* 2010 study results will be released in 2012.



in the past year due to their own alcohol use than women (5.1%). Māori respondents were significantly more likely (after adjusting for age) than the total population sample to have had injuries due to their alcohol use in the last 12 months, while Asian men and women were much less likely to have had injuries due to past-year alcohol use. No significant differences were apparent for Pacific peoples compared with the total population.

Connor and colleagues (2005) note that variation in the drinking patterns of Māori and non-Māori in New Zealand means that use of a single drinking pattern measure may result in an under-estimation of the national health burden that is attributable to alcohol (as a more detrimental drinking pattern in the smaller Māori population – drinking less often but more on a typical drinking occasion - is masked by the majority pattern), and may also mask disparities in health between the Māori and non-Māori populations.

Kool and colleagues (2011) have commented that New Zealand lacks the comprehensive national profile of home injuries that is necessary to develop effective targeted injury prevention initiatives. Their study of Ministry of Health public hospital discharge (2000-2009) and mortality data (1998-2007), found that poisonings and falls are the leading causes of unintentional home injury deaths among young and middle aged New Zealanders. They concluded that “the large numbers of home injuries occurring each year in New Zealand mean that even moderately successful injury prevention activities could have large impacts at a population level”.

6.3 Where injuries occur

The *Collaborative Study on Alcohol and Injuries* described in Section 6.1 found that alcohol-related injuries were more likely to occur in public places in all countries in the study (except Canada and the Czech Republic where the patient's home was the most common location), and this reflects evidence reported in other international literature (World Health Organization, 2007). However, Humphrey and colleagues (2003) report (describing the New Zealand part of the *Collaborative Study on Alcohol and Injuries*), that “[i]njuries in which alcohol was a factor were more likely to occur in the home (29%) and in a licensed outlet (23%), with public place and private vehicles the two next most common locations (21% and 16% respectively)”¹².

Humphrey and colleagues also note that, when drinking and injury location were not the same, public place and vehicle were the likely injury locations, “... possibly indicating a risk of travelling from one drinking location to another (drinking or not) location” (Humphrey, et al., 2003). Where drinking and injury location were the same, home (own or others) and licensed outlets were the most commonly reported locations for injury.

The home is also identified by another New Zealand study as a key location where alcohol-related injuries occur. A cross-sectional survey was undertaken with patients aged 16 years and older who presented to three Dunedin *primary care* facilities with injury (first presentation) (McLean & Connor, 2009). Of 316 eligible respondents, 53 (17%) had consumed an alcoholic drink in the six hours prior to injury. The majority of drinkers (62%) had consumed their last drink at a house or flat.

¹² It was not possible to ascertain from the two reports the reason for these different conclusions.



6.4 Association of injury with volume and patterns of alcohol consumption

Rehm and colleagues (2009) investigate the burden of mortality and disease, attributable to alcohol, both globally and for ten large countries. They identify two dimensions of alcohol consumption that affect health: average volume of alcohol consumption and patterns of drinking. Case-crossover and case-control studies have found a positive relationship between alcohol consumption and risk of injury, with risk increasing with an increase in quantity of alcohol consumed on the day of the injury (World Health Organization, 2007).

In the World Health Organization *Collaborative Study on Alcohol and Injuries* (World Health Organization, 2007), described earlier, that investigated the role of alcohol involvement in *non-fatal* injuries among emergency department attendees in 12 countries around the world, the quantities that injury patients reported typically consuming were markedly different across the participating studies. However, the authors identified an association whereby, in 11 countries (New Zealand data was not compatible for this analysis), alcohol-related injury participants were more likely than non-alcohol-related injury cases to consume alcohol at least once a week. The authors also identified that the median amount of self-reported absolute alcohol consumed prior to alcohol-involved injury was 103 ml (equivalent to about seven cans of beer) and the risk of an alcohol-related injury increased with every 30 ml (two cans of beer) of alcohol consumed.

An analysis of data from 27 emergency department studies from the *Emergency Room Collaborative Alcohol Analysis Project* investigated the influence of drinking patterns on risk of injury (Ye & Cherpitel, 2009). The authors grouped drinkers into the following categories: low-risk (usual volume less than 7 drinks a week for women or 14 drinks for men and never had any 5+ occasions for men and women during the last month); chronic high-volume (usual volume more than 7/14 drinks a week, but never 5+ in the last month); risky single-occasion drinkers (usual volume less than 7/14 drinks a week, but at least 5+ once in the last month); risk accumulators (usual volume more than 7/14 drinks a week, and at least 5+ once in the last month).

Ye and Cherpitel (2009, p. 9) report that, “in most studies, compared to low-risk drinkers, chronic high-volume drinkers, risky single-occasion drinkers and risk accumulators all reported a higher risk of alcohol-related injury (based on reporting drinking prior to injury or a positive BAC)”. Further, when the individual studies were combined, risk accumulators had the highest risk of alcohol-related injury. However, both chronic high-volume drinkers and risky single-occasion drinkers also had an elevated risk compared to low-risk drinkers. “These findings suggest that risk of alcohol-related injury is not only related to heavy episodic, but also to chronic high-volume drinking, and highest when both conditions are met” (p. 8).

Using data from the United States 2005 *National Alcohol Survey* (6,919 respondents), Cherpitel and Ye (2009) investigated the association of injury with volume and pattern of consumption in the general population, and differences in association for injuries treated in the emergency department, injuries treated elsewhere and injuries that were not treated. Based on their findings, the authors conclude that “... no safe level of consumption appears to exist in relation to injury risk. Risk of injury appears to occur at relatively low levels of consumption (as little as one drink per day)” (p. 5).



For example, Cherpitel and Ye describe the risk of injury (by average daily volume) peaking at half a drink per day for any injury and for a treated injury, and then levelling off, while risk increased to four drinks per day for an injury treated at an emergency department and then fell at higher mean daily volume levels. They report that "... risk was highest at just one 5+ day for any injury and a treated injury, while risk of an ER-treated injury increased to 78 5+ days, and then fell" (p. 4). Based on these findings, the authors suggest that preventive efforts be directed at more moderate drinkers. They note that heavier drinkers are fewer in number and their increased consumption does not appear to carry a proportional increase in injury risk.

Cherpitel and Ye also found that the "... association of volume and high maximum days with risk of injury is different for injuries treated in the ER compared to those treated elsewhere or those that go untreated, and this is important to take into account in deriving estimates of the risk of injury related to alcohol and alcohol attributable fractions".

Two related Swiss studies considered alcohol as a risk factor for injuries (including patterns of consumption) (Gmel, et al., 2007; Kuendig, et al., 2008). Using data from 3,592 injured patients attending the surgical ward of the emergency department of the Lausanne University Hospital (January 2003 - June 2004), the authors estimated the risk relationships of different levels of alcohol consumption, using 3,489 non-injured patients as controls.

Risk relationships between injury and *acute* consumption were found for all injury causes (transportation-related injuries, falls, exposure to forces and other events, and interpersonal violence), mostly with dose-response relationships¹³. Other interesting findings include:

- ◆ Low and medium levels of alcohol consumption generally were associated with most of the total alcohol-attributable fractions.
- ◆ The risk of sustaining injury was present at even low levels of alcohol consumption, and injury risks increased with increasing blood alcohol concentration.
- ◆ Acute intake is more predictive of current injury than the pattern of general consumption, with injuries sustained mostly by normal/moderate drinkers with occasional heavy episodic drinking, rather than by patients with alcohol use disorders. The authors suggest that this may be because the tolerance of these drinkers is lower than that of chronic heavy drinkers and that they are more impaired when drinking larger amounts than usual.
- ◆ *Repeated* injuries seem to be related more with general consumption patterns than with acute intake, and this appears particularly the case for chronic heavy drinkers, where repeated injuries were more often found among those who usually drink heavy amounts, have large acute intakes, and binge-drink.
- ◆ Injuries from interpersonal violence are associated more than other injury types with high levels of acute consumption (in this study, the researchers were unable to distinguish between victims and perpetrators).

¹³ A dose-response relationship describes how the likelihood and severity of adverse health effects (in this case, injury) are related to the amount and condition of exposure to an agent (in this case, alcohol)



- ◆ Depending on the injury cause, between 15 and 33 percent of injuries could have been avoided if the patient had avoided alcohol in the 24 hours prior to the injury (the authors note that their findings agree with a range of previous studies that have estimated alcohol-attributable fractions).

Babor and colleagues (2010) note that studies, such as those described above, show that the risk of intoxication and related injury can be more effectively predicted by including analysis of pattern of drinking, with much alcohol-related injury being experienced by light to moderate drinkers who occasionally drink heavily, rather than a smaller group of chronic heavy drinkers.

However, these results do not mean that chronic drinkers are not at greater risk of alcohol-related injury. A U.S. study used longitudinal data from the Department of Veterans Affairs health care system linked to data from the Center for Disease Control's National Death Index Plus database and identified 3,944,778 individuals who utilised Veterans Affairs services from 1 October 2000 to 30 September 2001 (Fudalej, et al., 2010). Of these, 122,427 individuals were diagnosed with an alcohol use disorder (AUD) during the study period. Individuals with AUDs had a greater increase in risk for injury-related fatality ($HR^{14}=3.3$) than non injury-related fatality ($HR=2.2$) relative to individuals without an AUD. Those who died as a result of injury were younger and more likely to be male¹⁵, Caucasian, to have drug use disorders, and to have medical comorbidity, than those alive at the end of the study.

6.5 The impact of alcohol on injuries to children, adolescents and young adults

A report by the New Zealand Child and Youth Mortality Review Committee (2011) found that alcohol was involved in 87 deaths of children and adolescents aged four weeks to 24 years and 364 days, during the years 2005 to 2007 (where the death was *completely* attributable to alcohol or alcohol *clearly contributed* to the death). Eighty-five of the 87 deaths were children and young people aged 15 years and older. Deaths were from the following causes:

- ◆ Motor vehicle (2007) – 31 percent.
- ◆ Drowning (2005-2007) – 15.7 percent.
- ◆ Assaults (2005-2007) – 29 percent.
- ◆ Poisoning (2005-2007) – 20.6 percent.
- ◆ Suffocation (2005-2007) – 9.7 percent.
- ◆ Falls (2005-2007) – 30 percent.

¹⁴ Hazard ratio.

¹⁵ The authors note that, as the vast majority of individuals in this study were male, this may be a limitation of the study when generalising the findings to women.



In 55 (63.2%) of the 87 alcohol-related deaths, the young person who died had consumed the alcohol that was responsible for the death, in 28 cases (32.2%) another person had consumed the alcohol responsible for the death, and in four cases it was both the young person who died and another person who had consumed the alcohol that was responsible for the death.

6.5.1 Children

Only very limited information was identified on children and alcohol-related injuries, and this research has a number of limitations.

Damashek and colleagues (2009) note that a previous study on the effect of both mothers and fathers' alcohol use on children's serious injuries (using a large nationally representative sample of 12,360 in the United States), found that the children (under 18 years) of problem drinkers and alcoholics were more likely than other children to sustain medically attended injuries (Bijur, et al., 1992, *cited in* Damashek, et al., 2009). However, they note that this study only investigated distal adult drinking (i.e. the overall pattern of drinking behaviour).

A study by Damashek and colleagues (2009) into the association of proximal caregiver alcohol consumption (i.e. drinking occurring at a particular point in time) and supervision with children's injury occurrence and severity was undertaken using a case-crossover design. The U.S. study used a community sample of 170 mothers of toddlers, who were interviewed bi-weekly about their children's daily injuries over six months. The authors found that self-reported proximal caregiver-reported alcohol use predicted a higher likelihood of injury occurrence and higher injury severity. Caregiver-reported supervision predicted lower likelihood of injury occurrence and lower injury severity. The authors conclude that, even at low levels, alcohol use by proximal caregivers may contribute to higher risk for childhood injuries and to more severe injuries.

6.5.2 Adolescents and young adults

Adolescence is generally associated with increased risky or dangerous behaviour and these behaviours can be made worse with the consumption of alcohol, with its potential disinhibiting effects. The Australian National Health and Medical Research Council (2009, p. 86) notes that "[t]he elevated rate of 'high-risk' drinking in the young adult age group is due to young people being more likely to drink a large amount of alcohol in a short space of time, typically on weekends. These drinking patterns are reflected in the types of harm, which typically include drink driving and violence".

Fergusson and Boden (2011, p. 218) (from the Christchurch Health & Development Study¹⁶, University of Otago), in a review of the research conclude that "alcohol is widely used and misused by young New Zealanders, with estimates suggesting that over 1 in 3 young people aged 12-16 engage in binge drinking and a similar fraction of young people aged 16-21 engage in hazardous drinking". In their review they describe some of the factors that have been identified as being associated with the use and misuse of alcohol by adolescents, including genetic factors, socio-demographic factors, family factors, peer influences, and access to alcohol.

¹⁶ A longitudinal study of a birth cohort of 1,265 New Zealanders born in Christchurch in mid-1977.



In another review, on the consequences of adolescent alcohol use, Boden & Fergusson (2011) report that adolescent alcohol use is associated with a wide range of adverse short- and long-term outcomes. These include an increased likelihood of accidents, sexual assault and violence victimisation and perpetration. They go on to say that *higher* levels of alcohol use or alcohol abuse/dependence are associated with more unfavourable outcomes.

The WHO *Collaborative Study on Alcohol and Injuries* (World Health Organization, 2007) described in Section 6.1 found that the age group under 30 years dominated participant numbers for all injury and alcohol-related injury cases in 10 countries (in Canada and China the dominant injured age group was 30-39 years). The authors of the study report suggest that this is likely to be related to drinking patterns more commonly seen among young people, such as binge drinking.

It has been suggested that the issues for young adults are similar. “[L]ike adolescents, young adults continue to be greater risk takers than older adults, but still have poorly developed decision-making skills – factors that are reflected in the high levels of injuries sustained by this age group” (National Health and Medical Research Council, 2009, p. 85).

New Zealand secondary school and tertiary students

The *Youth’07* survey of 9,107 secondary school students in New Zealand is a national youth health and wellbeing survey¹⁷ (Adolescent Health Research Group, 2008). A report from the *Youth’07* survey focuses specifically on young people and alcohol (Ameratunga, et al., 2011).

In 2007, 71 percent of students responding to the survey reported having ever drunk alcohol, and 61 percent reported currently drinking. Binge drinking (consuming five or more alcoholic drinks in one four-hour session) in the past four weeks was reported by 34 percent of respondents. Answering a question about adverse effects experienced over the previous year, current drinkers in 2007 reported several types of harm that had been associated with their drinking:

- ◆ Being injured was reported by 22 percent of current drinkers.
- ◆ Injuring someone else was reported by eight percent (10% male and 6% female).
- ◆ Having a car crash after drinking was reported by two percent of respondents.

Some more detailed information was available:

- ◆ There were significant associations between the level of deprivation that current drinkers lived in and the proportions who reported injuring someone else (low deprivation, 6%; medium deprivation, 8%; high deprivation, 13%).
- ◆ There was significant variation between ethnic groups in the proportions of current drinkers reporting being injured (Māori, 27%; Pacific, 24%; Asian, 10%; NZ European 21%; Other, 19%).

¹⁷ Funded by the Health Research Council of New Zealand, Department of Labour, Families Commission, Accident Compensation Corporation, Sport and Recreation New Zealand, Alcohol Advisory Council of New Zealand, and the Ministries of Youth Development, Justice and Health.



- ◆ There were also significant differences between same/both-sex-attracted and opposite-sex-attracted students in the proportions of current drinkers reporting being injured (same/both-sex-attracted 29%; opposite-sex-attracted 22%).

A web survey on drinking and alcohol-related harm completed by 2,548 undergraduate students, aged 17 to 25 years, at five New Zealand universities provided data on pre-university alcohol use, recent alcohol use, and alcohol-related problems (Kypri, et al., 2009). The survey provided information on levels of consumption and also identified that, over the previous 28 days, students reported an average of approximately two different alcohol-related problems. The most prevalent were hangovers (55%), blacking out (33%) and vomiting (21%). Other problems included physical aggression related to alcohol use (5%), sex they later regretted (9%), vandalism (5%), and drink driving or being a passenger with someone driving drunk (10%). The authors conclude that binge drinking and related harms are pervasive among New Zealand university students.

A cross-sectional survey of 316 injured patients aged 16 years and older at three Dunedin *primary care* facilities found that 38 percent of the tertiary students had been drinking prior to their injury compared with eight percent who were in paid employment (McLean & Connor, 2009). The study also found that drinkers were younger than non-drinkers. The authors note that these findings are consistent with other studies that have found hazardous drinking in New Zealand tertiary students to be associated with a wide range of harms, and that young New Zealanders (and particularly tertiary students) drink more hazardously than other age groups.

6.5.3 Early initiation into drinking

Early initiation into drinking has been linked to higher levels of harm. In a review of the research on the consequences of adolescent alcohol use, Boden and Fergusson (2011) note that earlier onset of alcohol use is associated with increased risk of both short- and long-term adverse outcomes compared with later onset.

Analysis of data from the *National Longitudinal Alcohol Epidemiologic Survey* in the United States found that youth who started drinking before age 15 (compared with those who waited until they were 21) were 12 times more likely to be unintentionally injured while under the influence of alcohol, seven times more likely to be in a motor vehicle accident after drinking, and ten times more likely to be in a physical fight after drinking (Hingson & Denkel, 2004). The significant relationship between starting to drink at a younger age and alcohol-related injury and trauma outcomes persisted after controlling for history of alcohol dependency, frequency of heavy drinking, years of drinking, age, gender, ethnicity, and illicit drug use. The relationships were found both “ever in the respondent’s lifetime” (the average age of respondents was 44 years), and in the year prior to the survey.

Another U.S. study used data from interviews conducted (in person) with a national multi-stage probability sample of 43,093 adults aged 18 years older in 2001 and 2002. From 2004 to 2005, 34,653 were re-interviewed (of 39,959 eligible respondents) (Hingson & Zha, 2009). Information was gathered on the age at which respondents started drinking, alcohol dependence and abuse, behaviours that increased risk of injury, and whether they had, under the influence of alcohol, injured themselves or someone else as a driver in a motor vehicle crash or in some other way.



Hingson and Zha found, in the follow up study, that early drinking onset was associated with respondents experiencing later alcohol dependence, more frequently consuming five or more drinks per occasion, driving under the influence of alcohol, and putting themselves in risky situations after drinking. After controlling for those behaviours and socio-demographic characteristics, early onset drinkers were more likely to have unintentionally injured themselves and someone else (20% of the unintentional injuries, and more than one-third injured in traffic crashes) when under the influence of alcohol.



7.0 Alcohol and its relationship to injury from road traffic accidents

SUMMARY

Authoritative research

Road traffic accidents make up a major component of alcohol-related unintentional injuries. A causal relationship between alcohol and road traffic injuries has been identified. The risk reduction if no alcohol had been consumed has been estimated at between 11 and 43 percent.

There is a dose-response relationship between alcohol consumption and motor vehicle crashes, with risk of injury increasing non-linearly with increasing alcohol consumption.

An increased risk of injury is apparent at very low levels of alcohol consumption.

Indicative research

It is estimated that around 40 percent of alcohol-related road traffic injuries in New Zealand are injuries to innocent victims (involving the drinking of someone other than the injured person), with most being passengers in cars.

There appears to be significant associations between drink driving behaviours and active traffic accident risk (where the driver's behaviour contributed to the accident).

Being visibly intoxicated appears to be a key factor associated with pedestrian casualties. The crash risk for pedestrians exponentially increases with increasing blood alcohol concentration, although the risk for pedestrians begins to increase at higher levels of BAC than it does for drivers. Pedestrians who use alcohol are likely to engage in risky street crossing behaviours.

In New Zealand, the overall risk associated with alcohol use by drivers reduces with increasing age. Risks at all BAC levels are significantly higher for drivers aged under 20 years (over five times) and for drivers aged 20 to 29 years (three times), than for drivers aged 30 years and over.

Male drivers are more likely to be involved in alcohol-related fatal crashes than females. However, in New Zealand, the proportion of female drivers affected by alcohol has increased in the past few years.

In New Zealand, from 2007 to 2009, disqualified and never licensed drivers in fatal crashes were much more likely to be affected by alcohol/drugs (50 percent of disqualified, 52 percent of never licensed) than drivers with a full licence (15 percent).

Consumption of alcohol by drivers can increase the severity of an accident. Drivers with relatively low BAC drive significantly faster than sober drivers and are significantly less likely to wear seatbelts.

Future research could look more closely at the additional mechanisms by which a low BAC degrades driving safety, possibly dividing them into those that relate to driving skill, such as speed and aggression, and those unrelated to driving skill, such as failure to wear seatbelts.

7.1 Estimating the impact of alcohol on road traffic accidents

The impact of alcohol on traffic injuries is a relatively well-researched area, and road traffic accidents make up a major component of alcohol-related unintentional injuries (Rehm, et al., 2004).

Rehm and colleagues (2004) reviewed the research available and determined that there is evidence of causality for injuries that occur as a result of road traffic accidents. They give the attributable fractions for road traffic injuries determined in four separate international reviews (that



based their estimates on meta-analyses or other summaries of the relations found in published studies). “Most of the [alcohol-attributable fractions] were directly derived, for example from police statistics, although there are case–control studies as well” (p. 1043).

The alcohol-attributable fractions for acute alcohol-related effects are detailed below:

- ◆ Stinson, et al., 1993¹⁸ (U.S. study): males 0.42; females 0.42.
- ◆ English et al., 1995 (Australian study): males 0.37; females 0.18.
- ◆ Single, et al., 1996 (Canadian study): males 0.43; females 0.43.
- ◆ Ridolfo & Stevenson, 2001 (Australian study): males 0.33 (deaths); females 0.11 (deaths).

The risk reduction, if no alcohol had been consumed, ranged from 11 to 43 percent for females and from 33 to 43 percent for males. Rehm and colleagues go on to say that causality for traffic accidents can be established since:

- ◆ Alcohol is clearly associated with the outcome.
- ◆ There is a dose-response relationship: the higher the BAC, the higher the chance of injury.
- ◆ There is a biochemical explanation for the relationship.
- ◆ With suitable interventions to reduce alcohol consumption, such as random-breath testing programmes, the outcome is reduced.

Babor and colleagues (2010) note that, in high income countries, around 20 percent of drivers fatally injured in road traffic accidents have a blood alcohol concentration above the legal limit, with higher rates in low and middle-income countries. They go on to say that moderate drinkers who occasionally drink heavily appear to be more at risk of alcohol-related road traffic accidents compared with those who qualify for an alcohol dependence or abuse diagnosis.

Data published by the Ministry of Transport (2010a) shows that, as crash severity increases, so does the contribution of alcohol/drugs. Alcohol or drugs were a contributing factor in 32 percent of fatal crashes, and nearly 21 percent of serious crashes from 2007 to 2009. For fatal crashes in this period, 26 percent of car and van drivers and 20 percent of motorcyclists were affected by alcohol/drugs. Two percent of truck drivers involved in fatal crashes were affected by alcohol/drugs, and there were no fatal crashes involving bus or taxi drivers affected by alcohol/drugs.

In the United States in 2009, the percentages of drivers involved in fatal crashes with a BAC level of .08 or higher were 29 percent for motorcycle riders and 23 percent for both passenger cars and

¹⁸ This and the following three studies are cited in Rehm, et al. (2004).



light trucks. The percentage of drivers with BAC levels of .08 or higher in fatal crashes was the lowest for large trucks (2%) (National Highway Traffic Safety Administration, 2010a).

However, Connor and colleagues (2004a) report a number of limitations with much routinely collected data, including the lack of reliable data on the blood alcohol levels of drivers in *non-fatal* injury crashes. In a New Zealand population-based case-control study, they investigated the contribution of alcohol to serious fatal and non-fatal car crash injuries in Auckland between April 1998 and July 1999. The researchers gathered data on 571 car drivers involved in crashes in which at least one occupant was admitted to hospital or killed, and on 588 controls recruited on public roads, who were representative of the case population and in proportion to the driving exposure of the case population.

Connor and colleagues found that consuming alcohol in the six hours before driving was strongly associated with serious injury crashes after controlling for known confounding factors. This was the case for drivers who self-reported drinking two or more 12 gram alcoholic drinks in the preceding six hours, for drivers with a blood alcohol concentration of 3 to 50 mg/100 mL, and for drivers with a blood alcohol concentration greater than 50 mg/100 mL. Once confounders had been taken into account, there was no evidence of an association between *chronic* hazardous drinking and the risk of a serious injury crash independent of the level of drinking at the time of the crash.

The authors also assessed the population-attributable risks and estimated that the proportion of crashes that could be prevented by eliminating all driving with a blood alcohol of at least 3 mg/100mL was 29 percent. The authors conclude that approximately 30 percent of car crash injuries in this study were attributable to alcohol, and two-thirds involved drivers with blood alcohol concentration in excess of 150 mg/100 mL.

In another New Zealand study, researchers from the longitudinal Christchurch Health and Development Study interviewed 1,011 participants at the age of 21 years. Of these, 907 reported driving a motor vehicle from age 18 to 21 years. They were asked about their driving experience, attitudes and behaviours, accident involvement and driving violations over that period. The researchers identified significant associations between drink driving behaviours and active traffic accident risk (where the driver's behaviour contributed to the accident), with high rates of drink driving behaviour in this cohort associated with rates of active traffic accidents one and a half times higher than those who did not drink and drive (Horwood & Fergusson, 2000).

New Zealand research on road traffic injury due to other people's drinking over the period 2003 to 2007 used crash data from the Crash Analysis System (Connor & Casswell, 2009). After adjusting for under-reporting, across all types of road users, the authors estimated that 28 percent (n=64,328) of road traffic injuries during the study period involved alcohol and that, of these, 43 percent were injuries to innocent victims (i.e. they involved the drinking of someone other than the injured person). This proportion was similar for fatal, serious and minor injuries. More than 70 percent of the innocent victims were passengers in cars, and almost all those (91%) in the under 15 years age group who were injured by someone else's drinking were passengers in cars.



7.2 Injury to pedestrians

In terms of accidents involving pedestrians, New Zealand data for 2005 to 2009 from the Ministry of Transport (2010b) identifies that crossing the road heedless of traffic, being visibly intoxicated and/or wearing dark clothing as being the most frequent pedestrian factors associated with fatal crashes. Approximately eight percent of all police-reported pedestrian casualties between 2005 and 2009 involved pedestrians who were reported as being visibly intoxicated. This rose to 12 percent for pedestrians aged over 18. These intoxicated pedestrians accounted for 47 fatalities (26% of all pedestrian fatalities), 126 serious injuries (10%), and 226 minor injuries (8%).

The Ministry of Transport notes that, while the crash risk for a pedestrian exponentially increases with increasing blood alcohol concentration, as it does for drivers, the risk for pedestrians begins to increase at higher levels of BAC. The Ministry, referring to the risk of a road crash¹⁹, concludes that “this indicates that it is considerably safer to drink and walk than it is to drink and drive”.

In the United States, national data (National Highway Traffic Safety Administration, 2010b) shows that alcohol involvement, whether for the driver or pedestrian, was reported in 48 percent of traffic crashes that resulted in pedestrian fatalities. Of the pedestrians involved, 35 percent had a BAC of .08 grams per decilitre or higher. Of the drivers involved in fatal crashes, only 13 percent had a BAC of .08 grams per decilitre or higher, less than two-thirds the rate for the pedestrians. In six percent of the crashes, both the driver and pedestrian had a blood alcohol concentration of 0.8 or higher.

A U.S. study on how alcohol use by pedestrians influences behaviours, medical management and outcomes, used data prospectively collected from December 2008 to September 2010 on all pedestrians aged 12 years and over presenting to a level 1 regional trauma centre after being struck by a motor vehicle within the previous 24 hours (n=665) (Dultz, et al., 2011). Evidence for alcohol use was defined as a BAC of more than 0.1 g/dL, or through a determination by the treating physician. Other information was collected through patient interviews and interviews with emergency personnel. Of the 665 patients involved in the study, the prevalence of alcohol use was just over 14 percent (95 people).

Compared to pedestrians who had not consumed alcohol, pedestrians with evidence of alcohol use were less likely to cross the street in the crosswalk²⁰ with the signal (23% vs. 65%) and more likely to cross either against the signal (23% vs. 12%) or mid-block (55% vs. 23%). There was a higher proportion of alcohol use by male pedestrians.

7.3 At what levels of alcohol consumption does injury occur?

Babor and colleagues (2010) outline the research on blood alcohol concentration and driving performance, including judgement and reaction times being impaired. They also point out that there can be impacts at even very low BAC levels, including impairment of a drivers' ability to

¹⁹ Not taking into account the risk of other types of injury to pedestrians, such as assault or falling.

²⁰ A path marked off on a street to indicate where pedestrians should cross.



divide attention between two or more sources of visual information. They cite research by Zador and colleagues (2000) that estimated that drivers with BAC levels between 0.02 and 0.049 percent were 2.5 to 4.6 times more likely to be involved in a single vehicle fatal crash.

Babor and colleagues (2010) also point to a relationship between accidents and average volume of alcohol consumed. However, Babor and colleagues note that "... it is not clear whether this relationship is independent of drinking patterns" (p. 53).

The work of Fell and Voas (2006) is cited widely as it provides a meta-analysis of the evidence regarding the benefits of reducing the blood alcohol concentration limit for driving (and a case for enacting a .05 BAC limit). They analysed 14 independent studies in the United States, and the results indicated that lowering the illegal BAC limit from .10 to .08 led to a five to 16 percent reduction in alcohol-related crashes, fatalities, or injuries.

Fell and Voas also point to laboratory studies that indicate that impairment in critical driving functions begins at low BACs and that most subjects are significantly impaired at .05 BAC. The relative risk of being involved in a fatal crash as a driver is four to ten times greater for drivers with BACs between .05 and .07 compared to drivers with a BAC of zero. Babor and colleagues (2010, p. 53) also note that, at the population level, "... changes in the legal BAC limit have an effect on motor vehicle crash rates, especially single-vehicle night-time crashes associated with drink driving".

A systematic review and meta-analysis undertaken by Taylor and colleagues (2010) to assess the dose-response relationship between acute alcohol consumption and injury included separate analyses for motor vehicle and non-motor vehicle incidents. Many of the studies used emergency department data. The authors found that the risk of injury increases non-linearly with increasing alcohol consumption for both motor vehicle and non-motor vehicle injuries, although non-motor vehicle injuries had a greater proportional per-drink increase in risk. The authors conclude that no level of consumption is safe for either category of injury and that, "... even for 2 standard drinks, the odds of injury are almost double for most types of injury" (p. 114).

Indeed, the World Health Organization cites a study that identified the risk of traffic accidents beginning to increase at a blood alcohol concentration of 0.04% (Blomberg et al., 2009 *cited in* World Health Organization, 2011). The case-control study was undertaken in two locations: Long Beach, California and Fort Lauderdale, and was based on data from 2,871 crashes of all severities and a matched control group of drivers selected from the same time, location, and direction of travel as the crash drivers. Increases in relative risk were observed at BACs of .04 to .05, and the elevations in risk became very pronounced when BACs exceeded .10 (once adjusted for covariates and non-participation bias). In the New Zealand population-based case-control study by Connor and colleagues (2004a), described in Section 7.1, that investigated the contribution of alcohol to serious fatal and non-fatal car crash injuries in Auckland between April 1998 and July 1999, "... equal proportions of alcohol-related injury crashes were attributable to drivers with blood alcohol concentrations of 3 to 50 mg/100 mL as those with levels of 51 to 150 mg/100 mL".

The consumption of alcohol can increase crash severity. An epidemiological study by Phillips and Brewer (2011), used data from the U.S. Fatality Analysis Reporting System on all people in fatal car accidents in the United States from 1994 to 2008 (n=1,495,667). The authors analysed the relationship between the *severity* of car accidents and individual BAC (in increments of 0.01%) and



found that the severity of life-threatening car accidents increases significantly at BACs much lower than the current limit of 0.08%.

Phillips and Brewer describe how their study sheds some light on why even low consumption of alcohol by drivers can increase the severity of an accident. They found that drivers with relatively low BAC drive significantly faster than sober drivers and are significantly less likely to wear seatbelts. As both these factors are associated with high accident severity, they suggest that future research could look more closely at the additional mechanisms by which a low BAC degrades driving safety, possibly dividing them into those that relate to driving skill, such as speed and aggression, and those unrelated to driving skill, such as failure to wear seatbelts.

The Ministry of Transport (2010a) also reports that drivers affected by alcohol in New Zealand are less likely to wear seatbelts than sober drivers. Of the car and van drivers killed between 2007 and 2009, 43 percent of those who had a blood alcohol level above the legal limit were not restrained at the time of the crash, compared with 15 percent for drivers whose blood alcohol level was known to be below the limit²¹.

7.4 The risks of injury for different age groups

In a review of risk factors for alcohol-related crashes among teenage drivers, Bingham and colleagues (2009) note that the research shows that while alcohol-related road crashes are less frequent among adolescent drivers aged 16 to 20 years than for older age groups, when this age group do drink and drive they are at much higher risk of being involved in a road crash (at all levels of blood alcohol concentration).

Bingham and colleagues identify several possible contributors to this increased risk for adolescents. These include a lack of driving experience and the fact that underage drinkers typically consume larger amounts of alcohol on individual occasions. Additionally, unlike adult drivers with passengers, adolescent passengers greatly increase the crash risk for adolescent drivers, with the risk increasing significantly with each additional passenger.

Of all drivers involved in fatal crashes in New Zealand from 2007 to 2009, the 20 to 24 and 25 to 29 years age groups were the most likely to be affected by alcohol/drugs. Above the age of 34 years, alcohol/drugs decrease as a contributing factor in fatal crashes (Ministry of Transport, 2010a). United States national data (National Highway Traffic Safety Administration, 2010a) shows that, in fatal crashes in 2009, the largest percentage of drivers with a BAC level of .08 or higher were aged 21 to 24 years (35%), followed by those aged 25 to 34 years (32%) and 35 to 44 years (26%).

A New Zealand case-control study investigated the influence of alcohol, age and number of passengers on the night-time risk of driver fatal injury (Keall, et al., 2004). Control data (breath alcohol measurements and other data) was obtained from roadside breath testing measurements of 85,163 drivers on Friday and Saturday nights between 1995 and 2000. This was combined with case data on fatally injured drivers from all crashes occurring on Friday and Saturday nights from

²¹ Restraint use was not recorded for about nine percent of the drivers killed..



1995 to 2000 (including BAC measurements from post-mortem results) in the areas covered by the control data.

Modelling of this data showed the estimated risk of injury increasing steeply with increasing blood alcohol concentration, although the increase was less rapid once BAC reached 200 mg/dl and above. The risks at all BAC levels were significantly higher for drivers aged under 20 years (over five times) and for drivers aged 20 to 29 years (three times), than for drivers aged 30 years and over.

After controlling for age and BAC level, driving with one passenger was associated with half the night-time risk of driver fatal injury relative to driving either alone or with two or more passengers. Keall and colleagues note that, based on these findings, "... a teenager at a BAC of 30 mg/dl ... carrying two or more passengers has a risk that is 34 times the risk of a sober driver aged [30 plus] driving with one passenger" (p. 60).

Another case-control study on the contribution of alcohol to night-time crash risk in New Zealand used data from 23,912 injury crash-involved drivers in 1997 and 1998) and control data from a survey of approximately 14,000 people from 7,000 randomly sampled households) (Keall, et al., 2005). It was found that the overall risk associated with alcohol use by drivers reduced with increasing age. The authors estimate that alcohol contributed to almost half of the weekend night-time risk for young male drivers (under 40 years) driving on lower volume roads but contributed little to overall risk on higher volume roads (the authors point out that other research has shown that high-volume roads are not favoured by drinking drivers).

7.5 Other factors in alcohol-related road traffic injuries

Describing international research, Babor and colleagues (2010) note that "typically, male drivers are about 1.5 times more likely to be involved in alcohol-related fatal crashes than females and the contribution of alcohol to such crashes peaks among U.S. drivers in their early 20s" (pp. 166-167).

Data published by New Zealand's Ministry of Transport (2010a) shows that, from 2007 to 2009, 82 percent of the alcohol/drug-affected drivers in fatal crashes were male. Only 17 percent of female drivers in fatal crashes were affected by alcohol/drugs compared with 24 percent of male drivers. However, the Ministry of Transport notes that the proportion affected in female drivers has increased in the past few years.

In New Zealand, from 2007 to 2009, disqualified and never-licensed drivers in fatal crashes were much more likely to be affected by alcohol/drugs (50 percent of disqualified, 52 percent of never-licensed) than drivers with a full licence (15 percent). Eight percent of the alcohol/drug affected drivers in fatal crashes are disqualified drivers (Ministry of Transport, 2010a). The Ministry of Transport (2011) released a report on high-risk drivers (unlicensed and disqualified drivers, drivers identified as evading enforcement or racing or showing off at the time of the crash, drivers with a blood alcohol level of at least fifty percent over the adult legal limit, repeat alcohol offenders, and repeat speed offenders). A higher proportion of Māori and Pacific at-fault drivers are in this high risk group. The report notes that this, to some degree, reflects the younger age profile for Māori and Pacific people compared to the European population.



The Ministry of Transport reports that, in the period 2005 to 2009, of 561 deaths in crashes where alcohol was a contributing factor, 66 percent were in crashes caused by a high-risk driver who had either a blood alcohol level at least 50 percent over the adult legal limit or had a prior alcohol offence. The 155 deaths from crashes with drivers with a prior alcohol offence comprised 28 percent of all alcohol-related deaths. Over half (57%) of those who died or were seriously injured as a result of these crashes were the drivers themselves, while 27 percent were the passengers of the high-risk drivers. Seventeen percent of the deaths and serious injuries were to other road users involved in the crash.

United States national data for 2000 to 2009 shows that drivers with a BAC level of .08 or higher in fatal crashes were eight times more likely to have a prior conviction for driving while impaired than drivers with no alcohol consumption (National Highway Traffic Safety Administration, 2010a). It also shows the times of the day and week when alcohol-related crashes are more likely to occur than non-alcohol-related crashes:

- ◆ The rate of alcohol impairment among drivers involved in fatal crashes in 2009 was four times higher at night than during the day (37% versus 9%).
- ◆ In 2009, 16 percent of all drivers involved in fatal crashes during the week were alcohol-impaired, compared to 31 percent on weekends.

In New Zealand, the Ministry of Transport (2010a) reports the most common times for fatal crashes that involve alcohol/drugs as a contributing factor to occur are late at night, or in the early morning from Thursday night through to Sunday morning.

Longitudinal data from the Dunedin Multidisciplinary Health and Development Study was used to analyse the relationship between adolescent problem behaviours and traffic crash involvement during young adulthood (Begg & Gulliver, 2008). Data on problem behaviours (delinquent behaviour, marijuana, alcohol, and cigarette use, and unsafe sexual behaviour) was collected at age 18 years.

After adjustment for confounding factors, the results from data collected at 21 years showed that delinquent behaviour predicted crash involvement (but not injury crashes) for females but none of the behaviours examined predicted involvement in any crash or injury crashes for males. At 26 years delinquent behaviour and smoking cigarettes predicted any crash for males and delinquent behaviour predicted injury crashes, but none of the behaviours examined predicted involvement in any crash or injury crashes for females. Alcohol use did not predict any of the outcomes for either males or females. The authors note that this is 'surprising', given a known association between alcohol and road crashes and they suggest that young adults (including those who drank higher quantities and at high frequency) may be responding to road safety messages about the dangers of drinking and driving.



8.0 Alcohol and its relationship to injury from falls

SUMMARY

Authoritative research

Acute alcohol use (within the previous six hours) increases the risk of unintentional falls among young and middle-aged adults, although the magnitude of this risk remains uncertain.

Indicative research

There is inconclusive evidence on any association between *usual* alcohol use and unintentional fall risk resulting in serious injury among young and middle-aged adults.

The role of alcohol in falls in older people is not clear, with alcohol emerging as a risk factor in some individual studies but not identified as a major risk factor in a number of systematic reviews.

Approximately 20 percent of unintentional falls at home may be attributable to the consumption of two or more alcoholic drinks in the preceding six hours. Even relatively low levels of alcohol may be associated with significant risk, and there is evidence of a dose-response relationship.

The most common locations for alcohol involved falls appear to be outdoor public places or private homes. Alcohol consumption may lead to an increased likelihood of falling from a height.

8.1 Falls among young and middle-aged adults

A systematic review published in 1987 identified an association between acute alcohol use and risk of fall, but identified a need for more case-control studies to establish the magnitude of the risk (Hingson & Howland, 1987, *cited in* Kool, et al., 2009).

Kool and colleagues (2009) undertook their own systematic review to quantify the risk of falls associated with acute and usual alcohol consumption in young and middle-aged adults (aged 25-60 years), including material published since the 1987 review. They identified only a small number of studies that met their criteria for inclusion: four case-control and three cohort studies and one case-crossover study. A meta-analysis was not attempted because of the variability in the methodologies used in the studies, and the authors also point to various methodological limitations, including confounding not being adequately considered in some studies, and potential recall and other measurement biases.

Despite these limitations, the authors found an increased risk of unintentional falls for this age group with increasing exposure to alcohol use. However, the magnitude of the risk varied markedly in the different studies, with some estimates being very broad. The authors conclude that there is "... modest evidence of a dose-response relationship with acute alcohol use" (p. 341). The association between *usual* alcohol use and fall risk was inconclusive. Evidence of a gender difference was also inconsistent.

Kool and colleagues note that their findings "... are consistent with those from Hingson and Howland's review and provide additional support for the contention that acute alcohol use increases the risk of non-fatal unintentional falls" (p. 345). They go on to discuss the need for more rigorous studies with sufficient power, and that adjust for potential confounders (e.g. fatigue and



recreational drug use), in order to more precisely estimate the magnitude of this risk, and to inform the development of falls prevention strategies. Kool and colleagues found that there was “...insufficient evidence to conclude that there is an important association between usual alcohol use and fall risk in this age group” (p. 345).

The *Auckland Falls Study* was a case-control study that used data on 335 individuals aged 25 to 60 years involved in a fall-related injury at home in the Auckland region that resulted in death or admission to hospital over a 12-month period commencing in July 2005 (Injury Prevention Information Centre, 2008; Kool, et al., 2008; Kool, 2009). Participants or next of kin completed structured questionnaires, and the control group (n=352) was randomly selected from the electoral rolls for the region from the same age group. Respondents were asked questions on a range of known and possible risk factors for falls, including alcohol consumption before the injury.

After controlling for confounding factors, the authors concluded that approximately 20 percent of unintentional falls at home in the group studied may have been attributable to the consumption of two or more alcoholic drinks in the preceding six hours (Kool, et al., 2008). The authors report that *acute* alcohol use had a “strong and consistent relationship with the risk of unintentional non-occupational falls at home among young and middle-aged adults resulting in admission to hospital or death” (p. 79). Even relatively low levels of alcohol consumption were associated with increased risk, and there was evidence of a dose-response relationship, with three and a half times the risk of a fall after two drinks (compared to no drinks consumed), increasing to over 13 times the risk for three or more drinks consumed in the previous six hours. (Kool, 2009).

An earlier New Zealand study also considered the role that alcohol plays in serious fall-related injury that results in hospitalisation of young adults (Fairnie, 2002). The mixed methods case-series/cross-sectional study involved 334 hospitalised young people (aged 16-29 years) from the Auckland region over a seven month period (from October 1999 to May 2000). The study found that recent alcohol use was self-reported by 23 percent (n=76) of those presenting to hospital for treatment of a fall-related injury, and that youth aged 20 to 24 years were more likely to have a positive finding of alcohol after a fall.

The highest number of alcohol-involved falls occurred in an outdoor public place (32%), or at own/others homes (46%). In contrast, falls not involving alcohol primarily occurred at a place for sport or recreation (52%) or at an outdoor public place (19%). Alcohol was associated with an increased likelihood of falling from a height. Fifty-four percent of falls from a height greater than one metre involved alcohol, compared with 36 percent of non-alcohol falls. The author points to alcohol producing new types of fall-related injury (e.g. falls from buildings, falls from collision and tripping or stumbling) (Fairnie, 2002; Injury Prevention Research Centre, 2002).

8.2 Falls among older people

While alcohol consumption is associated with falls in the total population, a number of systematic reviews were identified that specifically considered the risk factors for falls in the elderly. In the main, alcohol was not identified as one of the major risk factors for falls among the elderly, or the evidence-base did not use comparable studies that allowed a clear estimation of risk (Deandrea, et al., 2010; Gillespie, et al., 2010; Todd & Skelton, 2004).



However, some individual studies do find a relationship between alcohol and falls among older people. A systematic review of the literature reported at a 2008 conference²² found that the majority of the 20 identified studies were cross-sectional, and study methodologies varied. A positive association between alcohol and falls was identified in 11 studies, and five of these were statistically significant. One study demonstrated a statistically significant negative association, while two reported a non-significant protective effect; and there was a possible association in six of the studies. The authors conclude that "... differences in methodology, sample size, and settings make comparisons and definitive conclusions difficult. The apparent trend towards a relationship between falls and alcohol requires further investigation" (Crome, et al., 2008).

Sorock and colleagues (2006) point to several studies that have found no association between *regular* alcohol consumption and fall risk for elderly people, and also suggest more in-depth analysis is required to assess the nature of the relationship between alcohol and falls for elderly people. Their case-control study using U.S. national survey data compared 1,735 cases of people aged 55 years and over who died of falls, motor vehicle crashes or suicides with a control group (n=13,381) made up of a nationally representative sample. They found that having 12 or more drinks a year (i.e. drinkers versus non-drinkers) was associated with a 70 percent increase in the risk of death from a fall. Deaths from falls were age-related, with risk increasing for the 74-85 year age group and increasing again for those aged 85 years or over, and falls were more associated with heavy drinking in men than in women. The authors note that alcohol exposure just prior to the fall event is unknown.

²² 5th Congress of the European Union Geriatric Medicine Society "Geriatric Medicine in a Time of Generational Shift".



9.0 Alcohol and its relationship to other unintentional injury

SUMMARY

Authoritative research

Fire

There is substantial, but not definitive, evidence that alcohol plays a role in fire fatalities, and is a particularly important risk factor for fire fatalities and injuries associated with cigarette smoking. The evidence is less clear on minor burn injuries.

Indicative research

Cutting and piercing injury

In New Zealand, alcohol consumption leads to three times the risk of unintentional cutting or piercing injury occurring at home. A dose-response relationship is evident, with risk increasing with higher levels of drinking. However, all drinkers are at higher risk, not just those who engage in hazardous or dependent drinking.

Drowning

There is limited robust evidence on the effect of alcohol use on the risk of drowning during recreational aquatic activities, although anecdotal evidence and case series studies strongly support the presumption that alcohol use is a problem.

Around 30 to 70 percent of drowning victims involved in recreational aquatic activities have a measurable blood alcohol concentration, and a limited number of studies suggest that the percentage of drowning deaths that can be attributed to alcohol use appears to be in the range of about 10 percent to 30 percent, with the risk of drowning increasing with higher blood alcohol concentration. Incomplete testing for the presence of alcohol can make identifying the role of alcohol in drowning deaths difficult.

Studies suggest that males have higher drowning rates than females because of increased exposure to water and riskier behaviour, such as boating without a lifejacket and drinking alcohol before swimming alone. Alcohol may also impair parental supervision of children near water.

Workplace injury

While there may be some association between alcohol use and the likelihood of workplace injury, any association is not particularly strong, and may not be linear. It is possible that alcohol use and the likelihood of workplace injury are both determined by an underlying factor, such as a propensity to engage in risk-taking behaviour.

The amount of research available that considers the relationship between alcohol and unintentional injury varies considerably between the different injury types. While the scientific evidence points to alcohol being a risk factor for road traffic accidents and falls, there is less evidence available for areas of injury such as cutting and piercing injuries and drownings.

Using data from the *Emergency Room Collaborative Alcohol Analysis Project* and the World Health Organization *Collaborative Study on Alcohol and Injuries*, Borges and colleagues (2009) discuss the relative risk of the relationship between acute alcohol use and non-fatal injuries. They note the increased risk for road traffic accidents and falls and then also describe a smaller increased risk for a combined group of other non-intentional injuries, including choking, hanging, drowning, poisoning, burns, drug taking, and unknown. A total of 1,802 participants across the two studies provided the data for this group.



The following section describes the research literature that is available on the relationship between alcohol consumption and unintentional injuries, other than road traffic accidents and falls.

9.1 Cutting and piercing injuries

Thornley and colleagues (2011) note that cutting and piercing injuries are second only to falls in New Zealand as the most frequent cause of unintentional home injuries that lead to hospital admission among people aged 20 to 64 years. In a population-based case-crossover study, they investigated the role of *acute* alcohol use in unintentional cutting or piercing injuries at home.

The authors identified all people aged 20 to 64 years, resident in Greater Auckland, Waikato, or Otago, and admitted to public hospital within 48 hours of an unintentional non-occupational cutting or piercing injury sustained at home (their own home or another's) from August 2008 to December 2009. Research nurses undertook face-to-face interviews with consenting patients along with reviewing medical charts, and asked about the use of alcohol in the six hours before the injury occurred and the corresponding time intervals 24 hours before, and one week before, the injury. Any drinking was compared to no drinking during the case and control periods and, to investigate dose-response effects, no alcohol intake was contrasted to one to three drinks, or four or more.

Of 356 participants, 71 percent were male, and a third of participants sustained injuries from contact with glass. After adjustment for other paired exposures (sleep deprivation and marijuana use), the authors found that alcohol consumption led to three times the risk of unintentional cutting or piercing injury occurring at home. A dose-response relationship was evident, with risk increasing with higher levels of drinking. The results also suggest that "... all drinkers were at higher risk of cutting and piercing injuries after consuming alcohol, not just those with a high risk of hazardous or dependent drinking". Interestingly, smokers had higher alcohol-related risks than non-smokers.

Limitations identified in this study include a higher proportion of individuals of Māori and Pacific ethnicity among non-respondents, introducing a degree of selection bias, and reliance on self-reported data for capturing acute exposures and lifestyle factors.

9.2 Fire and burn injuries

Very little recent information was identified for this review on the role of alcohol in fire and burn injuries. Stokes and colleagues (2011, p. 17) note that "... many fire and rescue services are currently unable to determine the degree of the problem between alcohol consumption and fire".

9.2.1 The role of alcohol in fire and burn injuries

A number of international studies identify alcohol consumption or intoxication as a risk factor for fires. A widely cited systematic review published in 1987 (summarising research from the previous 35 years), found that most of the 32 studies identified were descriptive, reporting on the percentage of fire and burn victims who were exposed to alcohol (Howland & Hingson, 1987). The review covered a range of burns cases, including job-related burns and cigarette-related fire fatalities. Where data was available, the authors generated comparison groups to develop crude estimates of risk.



Among the findings of the review were that nearly half of those who die in fires are legally drunk at the time of death (based on relatively consistent results among the ten studies that had complete information on blood alcohol concentrations above 0.10%). Despite limitations in the identified studies, Howland and Hingson contend that there is "... substantial, although not definitive, evidence that alcohol plays a role in the etiology of fire and burn injuries and death" (p. 475).

A later review by the same authors found that studies conducted in the interim were consistent with the earlier reports (although no case-control studies had been conducted over that time). Hingson and Howland (1993) found that "... alcohol is more likely to be present when the burn victim dies than when the burn victim is injured" (p. 880).

Howland and Hingson (1987) suggest several mechanisms for how alcohol might increase the risk of fire and burn injuries. These include a direct link, where an intoxicated individual falls unconscious while smoking, but also more indirect links such as intoxication inhibiting appropriate responses, therefore preventing escape. However, the authors note that any determination on the causal role of alcohol requires information about alcohol exposure among the population not experiencing fatal fires or burns. Nevertheless, they argue that, "while this information is not directly available, clearly less than 50 percent of the general population are intoxicated at any given time, suggesting that alcohol exposure is a risk factor for fire deaths" (p. 480). They provide some further qualified support for this hypothesis from studies with comparison groups and from studies that compare alcohol exposure among victims of different types of accident.

They go on to say that alcohol is "... probably an important risk factor for fire and burn injuries associated with cigarette smoking" (p. 481). This is based on studies showing that alcohol exposure was more frequent among those who died in cigarette-ignited fires. Howland and Hingson conclude by calling for more rigorous studies to further investigate alcohol involvement in fire and burn *injuries*.

Indeed, a later review by MacDonald and colleagues (2006) of data from 45 emergency department studies and 11,536 injury patients, found that just over two percent of people with burn *injuries* were impaired by alcohol. They note that this differs markedly from an earlier meta-analysis on the role of alcohol in fatal injuries, which found that around 40 percent of fatally injured victims from residential fires were intoxicated (Smith, 1999, *cited in* Macdonald, et al., 2006). The probable explanation for this disparity is that alcohol impairment is more common in fire *fatalities* than in the types of minor burn *injuries* seen in this study.

9.2.2 Other factors in alcohol-related fire injuries

Stokes and colleagues (2011) describe research on fatal fires in London from 1996 to 2000 (Holborn et al., 2003, *cited in* Stokes, et al., 2011). Most deaths occurred in unintentional dwelling fires. Alcohol was identified as one of several risk factors. The authors found that 40 percent of victims tested (only 58% of all victims were tested) had blood alcohol concentrations in excess of the legal limit for driving in the United Kingdom (80mg/100ml), and 24 percent of these victims were highly intoxicated at their time of death (in excess of 200mg/100ml of blood). The majority of those who were "highly intoxicated" died between 9pm and 3am.

In the United States, Evarts (2011) describes data from the National Fire Incident Reporting System and the National Fire Protection Association's annual fire department experience survey.



He estimates that “... possible impairment by alcohol or drugs was a factor contributing to an average of 380, or 14%, of home fire deaths annually in 2005-2009”. Evarts notes that this is a lower rate than usually found in studies based on autopsy reports. Seventy-three percent of the victims were male, 90 percent were aged 15 to 64 years. Forty-two percent of these deaths resulted from fires started by lighted tobacco products.

In New Zealand, Miller and Beever reported, in 2005, that the majority of fires occur in “residential structures” (as is the case in most developed countries). Their paper reports on a study of behavioural factors in all unintentional residential fire deaths (56% of all fire deaths) from 1997 to 2003, based on inquest reports of 131 cases. They identified a number of significant behavioural risk factors, including alcohol consumption, acts of omission, carelessness, dangerous habitual behaviours, and consequences of disabilities.

Miller and Beever also identify key victim risk factors, including being male (63% of deaths), age (those aged 0-15 years made up 32% of deaths and those aged 60 years or over made up 40% of deaths), and being Māori (40% of deaths). They note that based on the socio-economic decile of properties in which these fire deaths occurred, a disproportionate number of fire deaths occurred in the most deprived areas. Additionally, 39 percent of victims had pre-existing health conditions that may have impacted both on their involvement and their death, including physical disabilities, sensory incapacities, cardiovascular conditions, dementia, and drug and alcohol abuse.

Of the fatal fires, Miller and Beever report that 45 percent occurred in the weekend, (between 6pm Friday and 6am Monday), and reflected “domestic and recreational activities, effects of fatigue, impairment from alcohol and drug consumption, smoking behaviours, involvement in social and cultural events, and, significantly, dangerous habitual behaviours”. The most common causes of fires in fatal events were unattended cooking (17% of deaths), careless smoking (13%), and unattended candles (10%).

Stokes (2011) notes that international studies on the role of alcohol in the incidence and consequence of fire have “... raised concerns about the data collections of fire and rescue services, including the ability to gather data and information at an incident, and the validity and reliability of this data and information”. In New Zealand, the Fire Service database on fire fatalities includes information on blood alcohol levels at the time of autopsy and, if available, any known history of alcoholism or drug taking. From 2000 to 2003, between 40 and 50 percent of fire fatalities were related to alcohol consumption. From 2004 to 2007, the rate varied between 25 and 31 percent, with 26.7 percent of the 15 fire fatalities in 2007 being related to alcohol. However, this database only records blood alcohol levels at the time of autopsy, and does not record information on the presence of alcohol for those *injured* in fires or on fatalities or injuries suffered due to the drinking of others.



9.3 Sport and recreation injuries

Little robust research was identified for this review on the role of alcohol in sport and recreation injuries.

9.3.1 Sports injuries

Only one study was identified on the relationship between alcohol and sports injury. This study was undertaken in Switzerland, with data from 8,694 emergency department patients at Lausanne University Hospital (between 1 January 2003 and 30 June 2004) being reviewed (Gmel, et al., 2009). Of the records reviewed, 4,861 patients had an injury, and 885 of these were identified as having a sports injury (18%). Alcohol consumption in the six hours prior to injury was associated with an increasingly higher risk of sports injuries compared with other injuries among women but not men. Both men and women injured while exercising were more often at-risk drinkers (men: 44%; women: 25%) compared with those injured during other activities (men: 37%; women: 13%). The authors suggest that these results indicate that both men and women, but particularly women, should not practise sports after alcohol consumption.

9.3.2 Drowning

Drowning can occur as part of sport and recreation activities, and it can also occur within the home environment and as a result of suicide or homicide. Most of the information identified in the research literature that discusses the role of alcohol in drowning is based on drowning as a result of recreational activity.

A systematic review of mainly U.S. studies that have measured alcohol involvement in deaths from recreational aquatic activity (Driscoll, et al., 2004) concludes that there is "... surprisingly little good quality epidemiological evidence regarding the effect of alcohol use on the risk of drowning during recreational aquatic activities" (p. 111). The authors note that anecdotal evidence and case series studies strongly support the presumption that alcohol use is a problem, but they found only one study on recreational boating that provided "... robust evidence of the extent of increased risk associated with various levels of blood alcohol" (p. 112).

This case-control study in the United States included all boating fatalities, but they were mainly drowning deaths (Smith, et al., 2001). The authors report that alcohol use increased the risk of fatal injury associated with boating at all measurable levels of alcohol, even with a BAC of 10 mg/dL, compared to zero. With a blood alcohol level of 250 mg/dL, the risk had increased to fifty times the baseline risk. The risks were similar for boat operators and passengers.

Driscoll and colleagues identify from their review that 30 to 70 percent of drowning victims involved in recreational aquatic activities have a measurable blood alcohol concentration, and the few relevant studies on degree of increased risk suggest that the population attributable risk (percentage of drowning deaths that can be attributed to alcohol use) seems to be in the range of about 10 percent to 30 percent. They note that the risk of drowning increases with higher blood alcohol concentration.



The authors conclude that “...alcohol appears to be widely used in association with recreational aquatic activity and to be an important risk factor for drowning associated with recreational aquatic activity” (p. 112). However, they also point out that there is a lack of information in many areas, with further research required to “confirm and characterise” the relationship between alcohol and drowning from the main types of recreational aquatic activity. They identify several areas for further research, including the following.

- ◆ The epidemiology of boating and/or non-boating, alcohol-related drowning incidents.
- ◆ The possible role of alcohol intake in persons supervising children under six years of age who drown.
- ◆ The effectiveness and acceptability of random sobriety checks for boat operators.
- ◆ Whether there is an appropriate permissible blood alcohol concentration or the need for a “zero tolerance” approach regarding alcohol use and boating.
- ◆ The feasibility of controls to limit alcohol consumption by swimmers.
- ◆ The development of guidelines on recording blood alcohol level information in drowning deaths.
- ◆ Ensuring that coroners determine the blood alcohol level for all persons (ten years or older) who drown.

Water Safety New Zealand (2011) analysis of data on fatal accidents as a results of immersion incidents (i.e. no intention of recreating in the water) from 2006 to 2010 shows these occurred in a range of settings, including rivers, beaches, home pools, and tidal waters, and that 21 percent of these incidents involved alcohol. Other data on fatal accidents shows alcohol was involved in:

- ◆ 11 percent of water sport/recreation drownings (e.g. swimming and diving/jumping)
- ◆ 19 percent of boating drownings
- ◆ 14 percent of land-based fishing drowning
- ◆ 3 percent of underwater (e.g. scuba diving and snorkelling) drowning.

In addition, data on different environments show that alcohol was involved in 30 percent of tidal water drowning, 25 percent of public pool drowning, 19 percent of river drowning, 17 percent of inland still waters drowning, and 14 percent of home pool drowning. Data on gender over the same period shows that 18 percent of male drowning and nine percent of female drowning involved alcohol. Data on ethnicity shows that 18 percent of European drowning, 17 percent of Pacific drowning, 15 percent of Māori drowning, and eight percent of Asian drowning involved alcohol.

In a review of drowning fatalities from 1980 to 2002 for those aged up to 24 years in New Zealand, McDonald and colleagues (2005) analysed Water Safety New Zealand DrownBase™ data and



found that there were 1,334 drowning related deaths over the 23-year study. Twenty-eight percent of deaths in those aged 15 to 19 years involved alcohol.

For all ages up to 24 years, 219 drownings were alcohol-related. Of these, the 110 that did not involve motor vehicle accidents, suicide or homicide were investigated further. The most common activities prior to death in these incidents were an “immersion accident” (55 deaths) and swimming (35 deaths). The remaining fatalities occurred during snorkelling, boating, rowing, scuba diving, fishing, rescuing others, or while engaged in non-water-related activities. Of 181 boating-related deaths, only nine (5%) were known to be alcohol-related. Providing possible explanations for this low number, the authors point to the younger age group being described in this study and a lack of routine testing for blood alcohol concentration.

Studies suggest that males have higher drowning rates than females because of their increased exposure to water and riskier behaviour, such as boating without a lifejacket and drinking alcohol before swimming alone. Alcohol may also impair parental supervision of children near water (Driscoll, et al., 2004; Howland, et al., 1996).

However, incomplete testing for the presence of alcohol can make identifying the role of alcohol in drowning deaths difficult. There is also potential for high blood alcohol readings due to blood alcohol levels changing after death due to decomposition processes (endogenous alcohol production) (Warner, et al., 2000).

A review of the New Zealand coroners’ files for people aged ten years and older who drowned from 1992 to 1994, found that only 36 percent of the 320 cases reviewed had involved testing for blood alcohol concentration. While the BAC was positive for 50 percent of those tested, the authors conclude that the lack of quality information available meant it was not possible to accurately estimate the role of alcohol in drowning (Warner, et al., 2000).

The challenge of missing data is also reported in Australia. A search of the Australian National Coroners’ Information System for all closed cases of people aged over 55 years, where drowning was identified as the primary or secondary cause of death, found 196 cases. The authors note that alcohol and drugs may have contributed to just over 12 percent of the drowning deaths. However, drug/alcohol information was missing in a quarter of all cases (Franklin & Mathieu, 2006).

9.4 Workplace injuries

In a review of the international literature, sponsored by ALAC, Kirkwood (2005) found “strong evidence” for the detrimental impact of alcohol and other drug use on performance in the workplace. However, Kirkwood concluded that “the data linking this impairment to increased risk of accidents, incidents, work-related injury and absenteeism are less clear” (p. 44).

A literature review by Beach and colleagues (2006) considered the published evidence over the period 1990 to 2004 for a causal role of alcohol and drugs in workplace injury (excluding those due to motor vehicles). This was not a systematic review (although the authors do provide a critique of each study). Of the 31 papers reviewed, 19 reported results compatible with an association between alcohol and workplace injury. Thirteen of these reported the use of alcohol as significantly increasing the risk of workplace injury. Three papers reported results suggesting that the use of alcohol might be protective; for example, one reported fewer days lost due to reportable workplace



injury among problem drinkers than among a control group. A further two studies reported a 'U' shaped association between alcohol use and workplace injury, with non-drinkers and heavy drinkers both at higher risk than light drinkers.

The authors conclude that, "on balance, the weight of evidence suggests there may be some association between general alcohol use and the likelihood of workplace injury, but that this association is not particularly strong, and may not be linear. It is not clear from these studies whether alcohol use and workplace injury are causally related. It remains entirely possible that alcohol use and likelihood of workplace injury are both determined by some underlying characteristic, such as propensity to engage in risk taking behaviour" (pp. 8-9).

A review undertaken by Ramchand and colleagues (2009) agrees that the relationship between substance use and occupational injuries is poorly understood. They point to two earlier reviews (in 1993 and 1994) that synthesised the literature on this topic, with one not finding enough evidence to establish a causal relationship between alcohol use and workplace injuries, and one with a wider scope that found some evidence that substance use negatively affected job behaviours and occupational outcomes, including injury. However, the influence of substance use on these injuries was small. This review also highlighted the poor methodological quality of most of the studies available.

In the review by Ramchand and colleagues, studies conducted since 1994 were analysed, and some improvements in methodological quality in some of the more recent studies were observed. The results from 33 studies were examined and the authors conclude that there is an association between substance use (including alcohol) and occupational injury. This association is stronger for males and in certain industries, such as manufacturing and construction. However, they also report that the proportion of injuries caused by substance use is relatively small.

Ramchand and colleagues note that other factors related to alcohol and substance use, such as social structures and level of risk aversion, may better explain injury than alcohol and substance use do, and where these are not sufficiently adjusted for, in studies that find a relationship between substance abuse and injury, there may be unobservable factors producing the relationship. They describe "... mounting evidence that harmful substance use is one of a constellation of behaviors exhibited by certain individuals who may avoid work-related safety precautions and take greater work related risks. Thus, we suspect that it is more likely that risk-taking dispositions, often termed deviance proneness, and other omitted factors can explain most empirical associations between substance use and injuries at work" (p. 31).

A further systematic review of epidemiological studies investigated risk factors for work-related road traffic crashes and injuries (Robb, et al., 2008). The authors did not attempt a meta-analysis because of the variability in the methodologies of the studies included. Indeed, the authors identified few methodologically sound studies, with the few robust studies identified covering "diverse risk factors in diverse populations". This meant they could not draw any definitive conclusions about factors that contribute to work-related traffic injury. However, they do note that alcohol and other drugs may not be a major factor in work-related crashes, particularly where random testing is in place.



10.0 Alcohol and its relationship to injury from violence

“Intentional injuries (violence, suicide) are complex and multifactorial phenomena. It is therefore more complicated to find the link between alcohol consumption and these kind of injuries” (Guillemont, et al., 2009, p. 81-87).

SUMMARY

Authoritative research

A causal relationship has been established between alcohol and violence from both individual and population-level studies. The relationship between alcohol and injury can be an indirect one – the person who has consumed alcohol may injure someone else (and possibly themselves as well).

The role that alcohol plays in violence is complex and the alcohol consumption of the victim as well as others can impact on the risk of injury. Alcohol-related violence is more closely related to pattern of drinking (i.e. a large quantity of alcohol consumed in a single drinking occasion) than to the overall volume consumed.

There appears to be a small to moderate association between alcohol use/abuse and male to female partner violence and a small association between alcohol use/abuse and female-to male partner violence. Data on men also shows a larger association of alcohol and aggression in clinical (e.g. groups of alcoholics) versus non-clinical groups, and in groups with more severe alcohol problems (e.g. alcohol abuse/ dependence and binge/heavy drinking).

More drinking is associated with a higher risk of experiencing suicidal behaviour, with acute alcohol use being a key factor, although the effect varies between cultures/countries. Future research could investigate how and why alcohol is associated with suicide.

Indicative research

Heavy episodic drinking is associated with increased victimisation and more aggression in interpersonal violence, and with increased severity of violent incidents.

Young adults involved in inter-partner violence are more likely to have grown up in home environments subject to multiple social, economic and related adversities. Alcohol abuse/dependence is a significant predictor of inter-partner violence victimisation and perpetration at age 25 years. The developmental antecedents of inter-partner violence are similar for males and females, although the actual effects of these risk factors may vary by gender.

There is limited evidence that suggests there is little gender difference in the effects that alcohol consumption has on the incidence of violent injury.

While acute alcohol use is associated with suicide, alcohol dependence has also been identified as an important risk factor for suicidal behaviour, with a number of research studies finding a high rate of attempted suicide in alcoholics.

A causal relationship has been established between alcohol and violence from both individual and population-level studies (Babor, et al., 2010; Cherpitel, 2007; Cherpitel, et al., 2005; Humphrey, et al., 2003; Room & Russow, 2001). “Consistent evidence has shown that a pattern of heavy drinking, alcohol use before injury, and positive and high blood alcohol concentrations (i.e. exceeding .08 ...) detected among injury patients in emergency departments are significantly associated with a greater likelihood of violent injury, as compared with non-violent injury” (Wells, et al., 2007, p. 824).



Room and Russow (2001) note that the role that alcohol plays in violence is complex and that the alcohol consumption of the victim as well as others can impact on the risk of injury. They go on to say that “... over the past decade, several studies on changes at the population level have demonstrated that an increase in the population’s alcohol consumption is followed by an increase in rates of violence in that population”. They note that alcohol-related violence is more closely related to pattern of drinking (i.e. a large quantity of alcohol consumed in a single drinking occasion) than to the overall volume consumed.

10.1 The role of alcohol in physical and sexual assault in New Zealand

A significant amount of New Zealand research is available on the relationship between alcohol and physical and sexual assault.

A review of the patients who had attended the Oral and Maxillofacial Surgery Service at Christchurch Hospital with facial fractures over an 11-year period (up to the end of 2006), found that 49 percent of the 2,581 cases were alcohol-related (i.e. a patient had had two standard drinks or more within an hour of the injury or the patient was injured by another person under similar influence) (Lee & Snape, 2008). This was often determined by patient self-reporting or recorded by the emergency physician who saw the patient before referral to the surgical service. Nearly 90 percent of the patients were male, and 59 percent of these male patients were in the 15 to 29 year age group. Interpersonal violence was responsible for 78 percent of alcohol-related fractures, with car accidents accounting for 13 percent.

The same data was used to measure the trend of alcohol-related facial fractures over two consecutive five and a half year periods (Lee, 2009). Over the two periods, the incidence of assault-related fractures rose and the incidence of motor vehicle accident-related fractures declined. Assault accounted for 73 percent of facial fractures in the first period and 82 percent in the second; and motor vehicle accidents accounted for 18 percent in the first period and eight percent in the second. There was no significant change between the two periods in terms of demographics, pattern of fractures and treatment modality.

An earlier study of 2,527 patients with facial fractures, treated at Waikato Hospital from 1989 to 2000, found that the numbers treated annually almost doubled over the period of the study, with 80 percent of those presenting with these injuries being male and 40 percent aged between 15 and 24 years (Buchanan, et al., 2005). The most frequent causes of facial fractures were interpersonal violence and road traffic accidents. Alcohol consumption was associated with just over a third of cases, with almost three-quarters (71.7%) of all interpersonal violence related with alcohol. Just over one-quarter of road traffic cases were alcohol-related. Māori patients were more likely than non-Māori to have consumed alcohol prior to their injury (46% of Māori patients compared with 28% of non-Māori).

A New Zealand Police *National Alcohol Assessment* uses fifteen police datasets (national and district) to identify trends and patterns in alcohol and police work (Stevenson, 2009). Among the findings of the report are the following on violent offending:



- ◆ At least one third of recorded violence offences committed in 2007/08 occurred where the offender had consumed alcohol prior to committing the offence.
- ◆ In homicides and incidents where tactical options were employed by Police, over half of the incidents occurred when either the subject or victim were affected by alcohol.
- ◆ Forty-five percent of youth alleged offenders included in the Youth Offender Risk Screening Tool project who committed a violence offence were identified by Police as having a moderate to very serious concern regarding their alcohol or drug use.

The relationship between alcohol and injury can also be an indirect one. That is, the person who has consumed alcohol may injure someone else (and possibly themselves as well). A New Zealand study by Casswell and colleagues (2011) focuses on the harm to others that can occur as a result of an individual consuming alcohol. The results come from a telephone survey of a nationally representative sample of 3,068 New Zealanders aged 12 to 80 years in 2008/2009.

Just over one in four respondents (28%) indicated that they had at least one person in their life who was a “fairly heavy drinker or sometimes drinks a lot” (a relative or partner not in the household, a friend, a household member, or a co-worker). The 85 percent of these respondents (n=760) who identified one person as the one whose drinking most negatively affected them, were asked about the adverse experiences and situations they had encountered in the last 12 months as a result of this person’s drinking. About seven percent reported being physically hurt by the other person and one percent reported being injured in a car accident. Of the 760 respondents, 334 had children under 18 years old in the household, and two percent reported the children were physically hurt because of someone else’s drinking.

Respondents were also asked about harms experienced because of the drinking of a stranger. Casswell and colleagues report that, of 2,142 positive responses, four percent reported being physically hurt, and one percent reported being injured in a car accident. The authors conclude that the drinking of people in various relationships (not limited to their immediate family) can have negative effects on others, including children. Casswell and colleagues go on to say that “establishing causal relationships in cross-sectional research such as this is difficult ... At the least, these data show the extent and range of harms that people attribute to the drinking of others” (p. 82).

A population-based survey of 16,480 adult New Zealanders (via telephone) investigated the 12-month prevalence of physical and sexual assault, and the association of assault with drinking by the perpetrator (Connor, et al., 2009). Nearly seven percent of men and three percent of the women surveyed reported having been physically assaulted in the previous year, and 44 percent of these reported more than one assault. One percent of women and 0.4 percent of men reported sexual assault, with 45 percent of this group reporting more than one assault.

More than half of the physical assaults and sexual assaults reported involved a perpetrator who was reported to have been drinking, and physical and sexual assaults were also associated with the usual drinking patterns of the victims. Alcohol-involved assaults were more likely to occur in pubs, bars or clubs, or on the street than assaults not involving alcohol. Medical attention was sought for 15 percent of physical assaults involving drinking by the assailant and ten percent of those not involving drinking. The authors note that this suggests that more than 62,000 physical



assaults and 10,000 sexual assaults occur every year that involve a perpetrator who has been drinking and that, of these, 10,500 incidents require medical attention.

The 2009 *New Zealand Crime and Safety Survey* was the fourth national victimisation survey commissioned by the Ministry of Justice and measured the nature and extent of crime in 2008, experienced by a sample of 6,106 New Zealand residents aged 15 years and over²³ (Morrison, et al., 2010). The survey asked victims whether they thought the offender was affected by alcohol or under the influence of drugs. It also asked victims about their own use of alcohol (but not drugs) prior to the incident. The measure of the victim's alcohol use is based on the victim's self-reported behaviour prior to the incident. Any victim who reported drinking at least one to two drinks prior to the incident is categorised as 'drinking'. On the basis of these measurements it cannot be assumed that either the victim or offender was in fact intoxicated at the time of the event" (p. 68).

Victims reported that both parties had been drinking prior to 23 percent of assaults and threats. The offender alone was drinking before 16 percent of incidents. Morrison and colleagues note that the proportion of incidents where only victims had been drinking was too small to be statistically reliable.

The World Health Organization *Collaborative Study on Alcohol and Injuries* (World Health Organization, 2007), described earlier in the review, identified a clear association in eight countries (including New Zealand), whereby the mean amount consumed by participants who suffered an intentional injury because of the actions of someone else was higher than for those who suffered an unintentional injury.

10.2 Demographic factors in violent offending and injury

As part of the *Emergency Room Collaborative Alcohol Analysis Project* and the World Health Organization *Collaborative Study of Alcohol and Injuries*, emergency department data were analysed from 30 hospitals in 15 countries to determine whether gender differences exist in the roles of drinking in the event (Wells, et al., 2007). The researchers investigated self-reported drinking before the injury and estimated blood alcohol concentration (after injury) and drinking pattern in explaining violent versus non-violent injuries.

In most countries studied, a larger proportion of men than women with a violent injury reported heavy episodic drinking, drinking before the injury and a positive BAC or BAC exceeding .08. While these findings are consistent with previous studies, the authors note that they may just reflect the fact that men drink more often and more heavily than do women in most countries.

To determine whether there was a causal role for alcohol in violent injury for men and women, Wells and colleagues tested gender-by-alcohol interaction effects in the prediction of violent versus non-violent injury. They found "little evidence to suggest that self-reported drinking before the injury or estimated BACs captured after injury were more important in the prediction of violent injury for men than for women". The authors describe the results as "preliminary" but suggest that

²³ Included a Māori booster sample of 1,600.



treatment and prevention efforts “... may need to target both genders equally or perhaps even focus more on heavy-drinking women”.

Studies undertaken by researchers at the Injury Prevention Research Unit (University of Otago) have looked at alcohol use by university students and related harms. In a web-based survey of a random sample of University of Otago students, with 1,564 respondents (82% response), one percent of women and 0.5 percent of men reported sexual assault in the past four weeks as the result of drinking. This was associated with higher AUDIT scores of the respondents, certain types of living arrangements and specific attitudes to drinking (Cashell-Smith, et al., 2007).

The *Pacific Drugs and Alcohol Consumption Survey* involved interviews with 1,103 randomly selected Pacific people (aged 13-65 years) in New Zealand (Huakau et al., 2005). While the proportion of Pacific drinkers is less than the proportion of drinkers in the general population (57% compared with 85%), Pacific drinkers consume larger annual volumes and typical occasion amounts of absolute alcohol than drinkers in the general population.

Huakau and colleagues also report that the drinking patterns of Pacific peoples appear to be more harmful, with greater proportions of Pacific peoples reporting violence and injury from other peoples' drinking, and greater proportions of Pacific drinkers reporting problems from violence and serious arguments as a result of their own drinking compared with the general population. For example, 18 percent of males and ten percent of females reported physical assaults as a result of other people's drinking. This compares with eight percent of males and five percent of females in the general population (as reported in the *National Alcohol Survey* held in 2000). Also, compared to the general population, higher proportions of Pacific peoples reported being involved in other accidents, as a result of someone else's drinking, that caused injury or major damage (5% of males and 4% of females).

10.3 When and where violent offending occurs

The World Health Organization *Collaborative Study on Alcohol and Injuries* (World Health Organization, 2007) found that injury involving violence occurred most often in a public place or in a licensed outlet. Data from the *National Alcohol Assessment* (Stevenson, 2009) provides information on where violent offending occurs in New Zealand:

- ◆ Of alleged offenders who consumed alcohol prior to offending, 42 percent indicated their *place of last drink* was at a home/private residence (irrespective of where the offence occurred or where the majority of the alleged offender's drinking occurred). Licensed premises and public places were each identified as a place of last drink for 18 percent of alleged offenders in 2007/2008.
- ◆ Public places were the most common location *where alcohol-related offending occurred*, irrespective of where the last drink was consumed.
- ◆ Those who indicated their place of last drink was at a licensed premises were more likely to be moderately or extremely affected by alcohol compared with those who consumed their last drink in a public place.



- ◆ A small proportion of licensed premises were identified as places of last drink by half of alleged offenders.
- ◆ The total number of apprehensions in which alleged offenders consume alcohol prior to offending peaks in December. On average, 33 percent of all recorded offences are committed on Friday and Saturday nights and Sunday mornings, coinciding with peak apprehension times when alcohol is recorded as a factor.
- ◆ Alleged offenders are more likely to be moderately or extremely affected by alcohol between midnight and 3am on weekends.
- ◆ There is a decrease over Easter weekends in the number of apprehensions during which people consume alcohol prior to offending, but no such decrease on ANZAC or Christmas Day.

10.4 Intimate partner violence

Foran and O'Leary (2008) note that there have been inconsistent findings from individual studies on the link between alcohol use/abuse and partner violence, with some reporting no association and others reporting weak, moderate or large associations. Foran and O'Leary undertook a meta-analysis to investigate the link between alcohol use/abuse and male-to-female and female-to-male partner violence.

Their review identified a small to moderate effect size for the association between alcohol use/abuse and male-to-female partner violence and a small effect size for the association between alcohol use/abuse and female-to-male partner violence. For men only, several moderators were also examined and there was a larger association of alcohol and aggression in clinical (e.g. groups of alcoholics) versus non-clinical samples and when measures assessed more severe alcohol problems (e.g. alcohol abuse/dependence and binge/heavy drinking). Foran and O'Leary suggest that research on "... alcohol and partner aggression needs to focus on deepening the understanding of when alcohol-related aggression occurs and when alcohol interacts with other relationship and individual variables" (p. 1232).

A New Zealand cross-sectional study used questionnaires sent to a random sample of 4,000 residents, aged 18 to 70 years (49% response rate; n=1,925) to describe the prevalence and severity of aggressive incidents between partners and any relationship with alcohol consumption (Connor, et al., 2011). The study investigated the proportion of incidents that involved drinking by one or both partners; the associations between gender, alcohol involvement and reported severity of aggression, anger and fear; and the association of usual drinking pattern with the occurrence of partner aggression.

Both men and women reported similar prevalence of victimisation and perpetration of aggression (11-15%), and alcohol was involved in more than 25 percent of incidents, and reported more by women than by men, particularly male-only drinking where the respondent was the victim. Drinking by one or both partners increased the levels of severity, anger and fear reported by victims. Heavy episodic drinking was associated with a threefold increase in victimisation and also with a doubling



of perpetration of partner aggression involving alcohol. Usual drinking patterns were not associated with aggressive acts that did not involve drinking at the time.

Connor and colleagues suggest that, as the involvement of alcohol is associated with increased severity, alcohol may be "... escalating aggression or affecting the perception of the aggressive act by the victim, or both" (p. 7). The authors note that while alcohol is associated with more partner violence, the role of alcohol at the time of the violence, and gender differences in partner violence, are not well understood.

In research on the developmental antecedents of inter-partner violence, researchers analysed data from 828 members of the Christchurch Health and Development Study aged 25 years who reported that they were currently, or had been involved, in a close or intimate partner relationship (that had lasted a month or longer) in the previous 12 months (Fergusson, et al., 2008).

Young adults involved in inter-partner violence were more likely to have grown up in home environments subject to multiple social, economic and related adversities. The study identified alcohol abuse/dependence as one of the significant predictors of inter-partner violence victimisation and perpetration at age 25²⁴. The developmental antecedents of inter-partner violence were found to be similar for males and females, although the actual effects of these risk factors may vary by gender.

10.5 Suicide

A review of the literature on the role of alcohol in suicide (Russow, 2000 *cited in* Babor, et al., 2010) identified a large amount of research that gave relatively consistent findings: more drinking is associated with a higher risk of experiencing suicidal behaviour, with frequent intoxication being a key factor.

Babor and colleagues (2010) agree that "... the relationship between alcohol and suicide or attempted suicide is well established for heavy drinkers", both from individual and population-level studies, although the effect varies between cultures. They also note that these "... studies suggest that more 'explosive' drinking patterns (e.g. irregular, heavy drinking occasions) are linked to a higher incidence of suicide" (p. 53). Therefore, countries where intoxication is common are likely to have a stronger association between alcohol and suicide.

An older analysis of the association between alcohol consumption and suicide rates in 13 nations of the world (including New Zealand) from 1950 to 1972, found that, in ten of the 13 countries, suicide rates were positively associated with per capita consumption of alcohol. This relationship was not found in New Zealand (Lester & Yang, 1998, *cited in* Lester, 2000; Sher, 2006). Sher (2006) suggests that a range of socio-cultural and environmental factors potentially influence suicide rates.

²⁴ The others were exposure to abuse in childhood, family dysfunction and adversity, and childhood and adolescent conduct problems.



An analysis of data from the National Violent Death Reporting System in the United States for 2005 and 2006 found that the overall prevalence of alcohol intoxication (BAC at or above 0.08 g/dL) was nearly 24 percent amongst those who died as a result of suicide (Crosby, et al., 2009). In a review of the literature on suicide, Sher agrees that *acute* alcohol use is associated with suicide. He goes on to say that intoxicated individuals are more likely to attempt suicide using more lethal methods. However, alcohol dependence is also an important risk factor for suicidal behaviour. Lester and Yang (1998, *cited in* Lester, 2000; Sher, 2006) describe a number of research studies that show a high rate of attempted suicide in alcoholics. Sher also points to mood disorder as a “more powerful risk factor for suicide among problem drinkers as age increases”. He suggests that all individuals with alcohol use disorders should be assessed for suicide”, with middle-age and older men with alcohol dependence and mood disorders at particularly high risk.

Sorock and colleagues (2006) note that similar findings on a relationship between alcohol and suicide have emerged for the elderly, pointing to data from a national mortality survey in the United States that associated moderate or heavy alcohol use with suicide in elderly, along with other studies linking alcohol use with suicide. Their case-control study using U.S. national survey data compared 1,735 cases of people aged 55 years and over who died of falls, motor vehicle crashes or suicides with a control group (n=13,381) made up of a nationally representative sample. They found that having 12 or more drinks a year was associated with a 50 percent increase in the risk of death from suicide. Drinking increased the risk more for men than women. The authors note that alcohol exposure just prior to the suicide is unknown.

Te Rau Hinengaro: The New Zealand Mental Health Survey provides information about the prevalence of mental disorders and their patterns of onset and impact for adults in New Zealand (Oakley Browne, et al., 2006). Data collection in late 2003 and 2004 involved interviews with a nationally representative sample of 12,992 people. Four groups of mental disorders were assessed, including substance use disorders. Alcohol use and its consequences were also assessed over the previous 12 months. Of those with an alcohol disorder, just over 16 percent reported suicidal ideation (thinking seriously about committing suicide); just over 7 percent reported making plans for suicide, and 4 percent of those with a substance use disorder (alcohol abuse or dependence, drug abuse or dependence, and any drug, alcohol or substance use disorders) reported making suicide attempts (Beautrais, 2006).



PART B: Interventions to reduce the risk of alcohol-related injury

This part of the review identifies research on interventions for hazardous and harmful drinkers that aim to reduce the incidence of alcohol-related injury. The emphasis is on interventions that have been evaluated for their effect on the incidence of injury.



11.0 Interventions in healthcare settings

“Brief interventions are characterized by their low intensity and short duration, consisting of one to three sessions of counselling and education. The aim is to motivate high-risk drinkers to moderate their alcohol consumption rather than promote total abstinence” (Babor, et al., 2010, p. 219).

SUMMARY

Authoritative research

A body of evidence has emerged that supports the effectiveness of brief interventions in primary care for reducing alcohol consumption and associated alcohol-related problems for those with hazardous drinking patterns.

No systematic reviews or meta-analyses were identified that specifically considered the impact of brief interventions in primary care on the incidence of injury.

Indicative research

In emergency department settings, brief interventions have been associated with approximately half the odds of experiencing an alcohol-related injury (they do not appear to do this just by reducing alcohol consumption). However, this is based on a small number of studies, and successful outcomes are not inevitable. Further research is recommended, with improved reporting of results and investigation into how any beneficial effects are mediated.

No clear indication of effectiveness has been found for brief interventions in other hospital settings that aim to reduce future incidence of injury.

There is some evidence that patients who causally attribute their injury to their use of alcohol may be more motivated and likely to change their behaviour.

Further research is needed on the impacts of brief interventions on different types of injury, and different levels of severity of injury.

Further research on factors that influence the efficacy of brief interventions in the emergency department could include characteristics of the patient, characteristics of the counsellor, characteristics of the intervention, and characteristics of the setting.

11.1 Primary care

Brief intervention in primary care is usually provided by general practitioners, nurses or psychologists. Intervention elements can include feedback on alcohol use and harms, identification of high risk situations for drinking and coping strategies, increased motivation, and the development of a personal plan to reduce drinking. The intervention usually takes five to 15 minutes for a general physician, and longer for a nurse (Kaner, et al., 2009).

Recently, a body of evidence has emerged that supports the effectiveness of brief interventions in primary care for reducing alcohol consumption and associated alcohol-related problems for those with hazardous drinking patterns (Babor, et al., 2010; Bertholet, 2005; D’Onofrio & Degutis, 2009; Kaner, et al., 2009). A systematic review and meta-analysis of 19 randomised controlled trials (a total of 5,639 participants) found that, for individuals attending primary care facilities but not seeking help for alcohol-related problems, a brief alcohol intervention was effective in reducing



alcohol consumption, as measured at six and 12 months after delivery of the intervention (Bertholet, et al., 2005).

A Cochrane systematic review and meta-analysis assessed the effectiveness of brief intervention, delivered in primary care (Kaner, et al., 2009). Twenty-nine controlled trials were identified with over 7,000 participants in total. Overall, brief interventions lowered alcohol consumption (where data on gender was available, the effect was still clear in men at one year of follow-up, but not in women), with the authors suggesting that longer duration of counselling probably has little additional effect. The authors note that benefits were similar in the normal clinical setting and in research settings with greater resources.

However, no systematic reviews or meta-analyses were identified that specifically considered the impact of brief interventions in primary care on the *incidence* of injury.

11.2 Emergency department

The positive association identified between the use of alcohol and injury highlights the potential importance of the emergency department (in addition to other settings) as a venue for screening and brief intervention or referral to treatment (Cherpitel, 2007).

The emergency department of a hospital provides a key location for the detection of people with alcohol problems and for intervention to try to reduce future harms from alcohol consumption. The most significant injuries will be seen in the emergency department, and for those who are suffering the effects of acute or chronic alcohol misuse, this may offer a “teachable moment” – where the patient is particularly receptive to advice about their alcohol consumption (Nilsen, et al., 2008).

While there is cumulative evidence that brief interventions can reduce alcohol consumption when delivered in healthcare settings, such as primary care, a limited number of randomised controlled trials means that it is not clear how these findings translate to the emergency setting (Babor, et al., 2010; Harvard, et al., 2008) and, specifically, whether such interventions can reduce the incidence of injury.

Various forms of brief intervention have been introduced or trialled in emergency departments. However, the number of published evaluations that consider the impact on future risk of injury (rather than just future drinking patterns) is still very small. One meta-analysis of the effectiveness of emergency department-based interventions found that, interventions were associated with approximately half the odds of experiencing an alcohol-related injury (Harvard, et al., 2008). The analysis identified 13 studies (published between January 1996 and July 2007) that evaluated the outcome of an intervention designed to reduce alcohol problems in patients presenting to an emergency department. Methodological data were extracted using review criteria adapted from guides developed by the Center for Disease Control and the Cochrane Collaboration.

Harvard and colleagues conclude that the methodological quality of the studies was reasonable, with the exception of poor reporting of effect-size information and inconsistent selection of outcome measures. All the studies reported an alcohol-related outcome, usually a combined quantity/frequency measure of consumption, frequency of heavy drinking, and negative consequences from drinking. Only three studies (from the United States) reported on alcohol-related injuries. These three studies took the following approaches:



- ◆ Injured patients (n=539) were randomly assigned to standard care, brief intervention (BI) or brief intervention plus a booster session (BIB). Injured patients were included if they were 18 years or older, and assessed as hazardous or harmful drinkers and/or had alcohol in their system at the time of their injury or emergency department visit. At one-year follow-up, patients receiving BIB, but not BI patients, had reduced their alcohol-related negative consequences and alcohol-related injuries more than those in the standard care group. All groups reduced the number of days of heavy drinking. Patients with histories of hazardous drinking responded to BIB, whether or not they had consumed alcohol prior to injury (Longabaugh, et al., 2001).
- ◆ Injured patients aged 18 to 19 years (n=94) who reported drinking prior to their injury or who had a positive BAC, were randomly assigned to receive either a brief motivational interview (including review of event circumstances, exploration of motivation, personalised and computerised assessment feedback, imagining the future, and establishing goals) or standard care (included a handout on avoiding drinking and driving that was also given to those receiving a motivational interview, and a list of local treatment agencies). Those delivering the intervention were 12 bachelor's to master's level staff members with one to two years of experience. All completed extensive motivational interviewing training.

On follow-up (at three months by telephone and at six months in person) patients who received the motivational interview had a significantly lower incidence of drinking and driving, traffic violations, alcohol-related injuries, and alcohol-related problems than patients who received standard care. Both groups showed reduced alcohol consumption (Monti, et al., 1999).

- ◆ Injured patients aged 13 to 17 years (n=152) with a positive blood alcohol concentration (or self-report of alcohol consumption in the six hours prior to injury) were randomly assigned to receive either a brief motivational interview or standard care. Both conditions resulted in reduced quantity of drinking during the 12-month follow-up, whereas alcohol-related negative consequences were relatively low and stayed low at follow-up. Adolescents who screened positive for problematic alcohol use at baseline reported significantly more improvement on two of three alcohol use outcomes (average number of drinking days per month and frequency of high-volume drinking) if they received a motivational interview compared with standard care. The authors conclude that brief interventions are recommended for adolescents who present to an emergency department with an alcohol-related event and report pre-existing problematic alcohol use (Spirito et al., 2004).

Harvard and colleagues note that, while the limited number of quality studies available suggests that emergency department-based interventions for alcohol problems do reduce alcohol-related injuries, they do not appear to do this by reducing alcohol consumption. They go on to say that regarding injury prevention, it may be useful to try focusing on harm minimisation strategies rather than strategies to reduce consumption.

The three studies above were all from the United States (and two involved only teenage patients). Harvard and colleagues conclude by saying that, with so few studies reporting on injury outcomes, the results can only be considered promising, with a need for further evaluation with improved



reporting of results. The author also express caution as most of the studies in the review used research staff to deliver the intervention, which would not be a sustainable approach for routine implementation.

Discussing their findings from one of the highlighted studies above, Monti and colleagues (1999) noted that both the standard care and the intervention group reduced their drinking as a result of the care they received but only the motivational interviewing group reduced the level of alcohol-related harms. They point to the need for more research on this area and suggest the motivational interview's focus on the harmful and risky effects of drinking appeared to have a significant impact, possibly changing the settings in which drinking occurred, or by reducing risky behaviours such as driving after drinking. D'Onofrio and Degutis (2009) note that these results are similar to those found in brief intervention studies in primary care, where alcohol consumption is reduced in both treatment and control groups but alcohol-related problems were only reduced in the treatment group.

A recent randomised-controlled trial undertaken in an emergency department in the United States demonstrated promising results for the impact of a brief intervention on reducing violence and alcohol misuse among adolescents (Walton, et al., 2010). Over a three-year period, 726 patients aged 14 to 18 years presenting at the department, and who reported past-year alcohol use and aggression, were randomised to an intervention group that received a 35 minute intervention (delivered by a therapist or via computer) or to a control group that received a brochure. The brief intervention combined motivational interviewing with skills training.

At a three-month follow-up, those receiving a brief intervention from a therapist showed self-reported reductions in the occurrence of peer aggression, experience of peer violence and violent consequences, compared to the control group. At six months, participants who received the brief intervention from both the therapist and via the computer showed self-reported reductions in alcohol consequences (e.g. missed school and trouble getting along with friends because of drinking). Interestingly, the interventions showed no significant impact on alcohol consumption measures.

While the computerised intervention did not show any effect in reducing violence, Walton and colleagues note that the therapist-delivered intervention did use computerised assessments, and the therapists and patients reviewed tailored feedback presented on the computer. The authors suggest that computers may play a useful role in standardising delivery of interventions, and might provide a useful means to prompt content for emergency department staff.

Another randomised-controlled clinical trial demonstrates that simply implementing a brief intervention in the emergency department may not be enough to achieve change in consumption levels or in re-admissions to hospital among hazardous drinkers (Daeppen, et al., 2007). The study was conducted between January 2003 and June 2005 in the emergency department of Lausanne University Hospital in Switzerland, where 5,136 consecutive patients attending after injury completed alcohol screening. Of the 1,472 patients (28.7%) who were assessed as hazardous drinkers, 987 (67.1%) were randomised into a brief alcohol intervention (a single 10 to 15-minute session conducted by a trained research assistant), a control group with screening and assessment, or a control group with screening only. The 12-month follow-up was completed by 770 patients (78%).



Data gathered at the 12-month follow-up indicated that similar proportions of each group were low-risk drinkers, and that there had been similar reductions across all groups in drinking frequency, quantity, binge drinking frequency, and AUDIT scores. There were also similar numbers of days hospitalised and numbers of medical consultations across all groups. The authors conclude that this 10 to 15-minute brief alcohol intervention did not decrease alcohol use or future health resource utilisation.

Daeppen and colleagues discuss the reasons for this result differing from other randomised controlled trials that have found a positive result for brief interventions in an emergency department setting. They suggest patient selection and the type of intervention may be factors. For example, they note that one trial included hazardous drinkers with facial injury, while the patients in this study had mainly minor injuries. In the same study, the intervention was conducted by senior nurses compared to “rather inexperienced interventionists” in this study. However, Daeppen and colleagues do point out that their providers did have more intensive training than in the other study (two days compared with two 90-minute sessions).

11.3 Other settings

A Cochrane systematic review was undertaken to evaluate the effectiveness of interventions for problem drinking (alcohol dependence, alcohol abuse, or hazardous use of alcohol) in preventing injuries and the antecedents to injury (Dinh-Zarr, et al., 2009). The systematic review considered interventions designed to reduce or eliminate alcohol consumption, prevent hazardous use of alcohol, or prevent injuries or their antecedents (e.g. falls, motor vehicle crashes).

Twenty-three eligible trials were identified (published between 1980 and 2002), with interventions delivered in a range of settings (brief counselling for problem drinking was evaluated in nine trials). The authors did not undertake a meta-analysis of the available data as there were such variable groups of participants, interventions, and outcomes amongst the different studies. Sample sizes were generally small, with few of the trials designed to measure effects on injuries, and the precision of most estimates was low. Dinh-Zarr and colleagues highlight the two studies that were large enough to demonstrate statistically significant reductions in alcohol-related injuries: Longabaugh (2001) and Monti (1999), both emergency department studies described by Harvard and colleagues above. The authors note that, while the evidence is not conclusive, the results indicate that interventions to reduce problem drinking can have beneficial effects on the incidence of injuries, particularly alcohol-related injuries.

Dinh-Zarr and colleagues also report that there was not strong support for the hypothesis that reduced alcohol consumption was the mechanism for any beneficial effects of treatment on injuries. The authors suggest that it is possible that beneficial effects on injuries are mediated by other aspects of treatment for problem drinking (e.g. receipt of medical attention and social support).

A systematic review by Nilsen and colleagues (2008) also investigated the effects of emergency care brief interventions for injury patients, but took a slightly broader approach in terms of setting, which included interventions in trauma centres and inpatient services. This means that they collected an overlapping but different set of studies to the review by Harvard and colleagues. The authors felt that the differences between the studies were too great to attempt to meta-analytically



combine the outcomes, leaving the “less satisfactory” method of counting which studies did and did not find an effect.

Of the 12 studies that compared results pre- and post-intervention, most targeted patients identified as risky or hazardous drinkers. Eleven found a significant effect of brief intervention on at least some of the outcomes: alcohol intake, risky drinking practices, alcohol-related negative consequences, and injury frequency (five studies explicitly aimed to reduce injury frequency). Five studies found no significant differences between outcomes for patients allocated to different interventions or to a control group. However, overall, intervention patients achieved greater reductions in alcohol consumption than control group patients, despite a tendency for control groups to also show improvements. More intensive interventions did tend to yield more favourable results.

However, the authors caution that they are unable to draw conclusions about whether *more* brief intervention (i.e. number, length or intensity of sessions) results in a greater treatment effect, with none of the studies showing a “simple stepwise increase in effect with higher dosage of the initial [brief intervention]” (p. 198), although one study did show the benefit of a booster session (see the Longabaugh study highlighted in Section 11.2). Nilsen and colleagues also consider that variations in methodologies, screening and assessment methods, and in injury severities, limit the conclusions that can be drawn on the effectiveness of brief interventions for injury patients.

A Cochrane systematic review investigated whether brief interventions reduce alcohol consumption and improve outcomes for heavy alcohol users admitted to general hospital inpatient wards (McQueen, et al., 2009). The authors found that patients receiving brief interventions did demonstrate greater reductions in alcohol consumption compared to those in control groups at six-month and nine-month follow-up but this was not maintained at one year. There were also significantly fewer deaths in the brief intervention groups than in control groups at six months and one year (based on studies involving mainly male participants). The authors note that simply asking participants about their drinking patterns may have had a positive impact on alcohol consumption levels and changes in drinking behaviour and that this needs further investigation.

McQueen and colleagues also considered whether these brief interventions improved quality of life and ability to function in society (i.e. social relationships, employment, education) and, of particular interest to this review, whether they led to a reduction in hospital re-admission rates, and or alcohol-related injuries (i.e. falls, violence, suicide, and motor vehicle accidents). One study considered the number of days hospitalised and emergency department visits in the previous three months (at follow-up interviews). But no significant differences were found.

In New Zealand, brief intervention in association with routine alcohol screening is not widely practiced in hospital settings (Hosking, et al., 2007). A study carried out by researchers at the University of Auckland and Auckland City Hospital formed part of a feasibility assessment of alcohol harm reduction interventions for patients admitted to hospital following unintentional injury. At the time of publication, the authors note that there was no formal screening programme in New Zealand hospitals, either targeted or universal, for detecting alcohol problems.

Hosking and colleagues undertook a retrospective analysis of the trauma registry database at Auckland City Hospital, and a review of hospital charts for documentation of alcohol screening and intervention. Of 1,970 patients admitted following unintentional injury during the study period, 23



percent had a blood alcohol test at admission. Approximately half of these tests were positive. The authors reviewed the charts of a random sample of 120 adults and found that, while 68 percent of charts reviewed included a general comment on alcohol use, only 7.3 percent recorded information that suggested a possible drinking problem. No formal alcohol screening interviews were documented, and only 1.5 percent of admissions received some form of alcohol intervention, with only one patient receiving a brief alcohol intervention. The researchers conclude that there was potentially a missed opportunity in this environment to reduce alcohol-related harm and trauma recurrence.

In an interesting Australian study, Lynagh and colleagues (2010) investigated the potential for ambulance officers in New South Wales to undertake screening and intervention. A cross-sectional descriptive survey of 264 New South Wales ambulance officers found that an estimated 20 percent of all callouts involved alcohol. Most officers (95%) reported usually or always asking patients whether they had been drinking but only 40 percent asked further questions about the quantity and frequency of alcohol use, and even fewer reported consistently discussing with or advising patients to change their drinking behaviour (4%), screening patients for alcohol problems using a formal screening tool (1%), or referring patients to an appropriate drug and alcohol service (4%).

Officers indicated that they were willing to undertake a number of other tasks as part of alcohol harm reduction efforts. Sixty-eight percent indicated willingness to refer patients to appropriate services, and 74 percent were willing to provide patients with written information on alcohol and local services. In addition, significant numbers were also willing to attend training programmes, meet with local general practitioners and other health care workers to identify and plan more effective referral networks, and work with police and other agencies to develop harm reduction strategies.

11.4 Moderators of effectiveness for brief alcohol interventions

Nilsen and colleagues (2008) note that a few of the studies in their review suggested that experiencing an injury and/or the experience of being in an emergency department may motivate patients to reduce their alcohol intake, without any intervention occurring. The authors point to previous research that shows patients who causally attribute their injury to their use of alcohol as being more motivated and likely to change their behaviour (they also note that a patient may not be able to drink as much as previously if the injury is serious).

One of these studies, with a cross-sectional design, analysed the drinking patterns of injury patients in a Swedish emergency department who acknowledged alcohol as a factor in their injuries and who expressed motivation to change their behaviours (Nilsen, et al., 2007). Of 1,930 patients enrolled in the study, 10 percent of those who reported drinking (i.e. not just those who had drunk leading up to the injury) acknowledged alcohol as a factor in their injury. They were more likely to report this if they had higher weekly intake and a higher frequency of heavy episodic drinking. Increased reporting of causality was also associated with increased discontent with drinking behaviours and an increasing desire to change these behaviours. The authors note that screening for patients who attribute their injury to alcohol may be a useful way for identifying patients who are most motivated to change, and most likely to benefit from intervention.



Walton and colleagues (2008) also consider the motivation for change that comes from understanding the role of alcohol in injuries incurred. They note that, while previous research has shown the effectiveness of brief interventions in an emergency department setting, there is limited understanding of the “mechanisms of change”. They suggest that, with such an understanding, brief interventions may be adapted to better meet the needs of less responsive groups of patients. They investigated these moderators in a study sample that participated in a randomised controlled trial of a brief intervention for alcohol misuse. In their study, injured patients presenting at a U.S. emergency department completed a computerised survey (4,476 were completed), and 575 “at-risk” drinkers were randomly assigned to one of four brief intervention types: advice and tailored booklet; advice and generic booklet; no advice and tailored booklet; no advice and generic booklet. Follow-up interviews were held with 85 percent of the patients three and 12 months after the initial presentation.

Overall, those patients who attributed their injury to alcohol had significantly lower levels of average weekly alcohol consumption and less frequent heavy drinking at the 12-month follow-up, compared with their baseline assessments. Further, those who had received advice showed a greater change than those who had not received advice. Indeed, those patients who received advice and *attributed* their injury to alcohol showed a 50 percent decrease in mean heavy drinking episodes from baseline to 12 months, compared with a 13 percent decrease for those patients who attributed their injury to alcohol but received no advice. Walton and colleagues conclude that attribution for alcohol-related injury is an important moderator of change. They suggest that highlighting the alcohol/injury connection in brief alcohol interventions in emergency departments could improve their effectiveness.

In a New Zealand cross-sectional survey of patients (aged 16 years and older) presenting with injury at three Dunedin primary care facilities with injury, 17 percent of the 316 eligible participants had consumed an alcoholic drink in the six hours before their injury and those with hazardous intake were significantly more likely to attribute their injury to their drinking (McLean & Connor, 2009).

Daeppen (2008), in a commentary on the meta-analysis by Harvard and colleagues (2008), discusses what can be learned from the systematic review conducted as part of the same study as well as other information from the published literature. He notes that, while several factors seem likely to influence the efficacy of brief alcohol interventions in emergency departments, only some have been evaluated in emergency and other settings. These include the following:

- ◆ Characteristics of the patient, such as age, sex, severity of alcohol use disorder, drinking pattern, readiness to change, and injury severity.
- ◆ Characteristics of the counsellor, including age, sex, training, supervision, relationship style, clinical skills, and their adherence to the structure of the brief alcohol intervention.
- ◆ Characteristics of the intervention itself, such as simple advice versus more structured techniques, whether feedback is included or withheld, whether a motivational interviewing style is adopted, the number of sessions and the objective.



- ◆ Characteristics of the setting: in an emergency department setting this can include issues such as privacy and whether the use of time is maximised while patients are in waiting rooms, and post-discharge. It can also include the interest and follow-up of staff.

Daeppen suggests that “considering the influence of the above factors, three hypotheses might be explored in ED settings using [brief alcohol interventions]: (i) it does; (ii) it does not; or (iii) it sometimes does and sometimes does not reduce alcohol use and related consequences” (p. 377). He concludes that the published research suggests that neither i or ii are likely, and that “probably the most likely hypothesis is that [brief alcohol intervention] sometimes does and sometimes does not reduce alcohol use, and that the (sometimes) mixed published results are best explained by the heterogeneity of various [brief alcohol intervention] factors” (p. 377).

In particular, Daeppen suggests the possibility that brief alcohol interventions might not be effective in emergency departments without some modifications from those used in primary care. He notes that, brief interventions in the emergency department are undertaken in a relatively hectic environment with the potential for frequent interruptions, and are generally limited to a single contact between the patient and the physician/counsellor, preventing the development of the type of therapeutic alliance seen in primary care.

D'Onofrio and Degutis (2009) describe other potential challenges in implementing brief interventions in emergency department settings. These include the discomfort that medical practitioners may feel in delivering the intervention, a lack of education on the intervention and its delivery, lack of incentives, lack of support from the organisation, concern about the reaction of patients, and time pressures.

D'Onofrio and Degutis note that it has been suggested that social workers should deliver the intervention, but that they are not generally present in emergency departments in sufficient numbers to make this approach feasible. Other emergency departments have used ancillary staff to deliver interventions in emergency departments. D'Onofrio and Degutis conclude that emergency department doctors and nurses need education if they are to deliver brief interventions in emergency departments, and resources for when referral of patients is necessary.



12.0 Interventions to reduce alcohol-related road traffic accidents

SUMMARY

Authoritative research

There is reasonable evidence to suggest that carefully planned and well-executed mass media campaigns, that attain adequate audience exposure, and are implemented in conjunction with other ongoing prevention activities, can be effective in reducing alcohol-impaired driving and alcohol-related crashes. Such campaigns can be cost saving. Important factors in such campaigns are likely to be message content, message delivery and message pre-testing.

Indicative research

There is insufficient (and conflicting) evidence as to whether brief interventions reduce motor vehicle crashes and related injuries.

Repeat drink driving offenders may be more likely than one-off offenders to be alcohol dependent, and may require a more comprehensive approach to intervention/treatment.

The assumption behind measures to reduce alcohol-related road traffic accidents is that deterrence, punishment and social pressure will reduce levels of drink driving and therefore alcohol-related injuries and fatalities. Babor and colleagues (2010), in a review of drink driving prevention and counter-measures, note that a range of legislative and enforcement measures have been found to be effective or potentially effective, including random breath testing, low or lowered BAC limits, and licensing restrictions. Legislation and enforcement are not within the scope of this review. However, education and persuasion through mass media campaigns have been used extensively along with other strategies that aim to reduce injuries as a result of drink driving²⁵.

While a range of other interventions (including designated driver programmes) have been used internationally to address rates of drinking, evaluations have not been identified of their effectiveness in reducing the incidence of injury. Babor and colleagues (2010) note that evaluations in the 1990's of two well-established safe ride programmes (one providing 2,500 free rides a year and the other providing 700 free taxi rides home over the Christmas/New Year period) found no measurable impact on annual crash rates.

12.1 Brief intervention

The Cochrane systematic review by Dinh-Zarr and colleagues (2009) described in Section 11.3 found insufficient (and conflicting) evidence as to whether the interventions studied (primarily brief interventions) reduced motor vehicle crashes and related injuries.

Mello and colleagues (2005) performed a secondary analysis of the data from the study by Longabaugh and colleagues (2001), described in Section 11.2, that showed a positive result from

²⁵ Interventions to make road environments safer are not considered in this review, e.g. road redesign.



a brief intervention with booster session in an emergency department setting. They considered the impact of the intervention specifically on emergency department patients with subcritical injuries from *motor vehicle crashes*. It was found that motor vehicle crash patients (n=133) given brief motivational intervention for alcohol plus a booster (n=34) had a third of the alcohol-related injuries compared with those receiving standard care (n=46). Indeed, for those groups of participants who had other injuries, there were no significant differences in the amount of injuries at the 12-month follow-up between the brief motivational intervention plus booster and standard care groups.

However, Mello and colleagues do note the limitations of this secondary analysis, including the analysis being performed on previously collected data in which testing for the effect on motor vehicle crash patients was not a primary aim. However, they also conclude that a differential effect may be achieved from brief intervention depending on the type of injury, and that emergency departments might consider intensifying their intervention effort for motor vehicle crash patients as they appear to be a group that may benefit most from interventions that aim to reduce future alcohol-related injuries. They hypothesise that this may be a result of the feelings of guilt and remorse if others were seriously injured, and also the result of other ongoing impacts including legal consequences and economic costs and inconveniences that may have become more apparent by the time the booster session is delivered.

In another U.S. study, interviews with a sample of repeat drink driving offenders found that over half (58%) were alcohol dependent (Lapham, et al., 2006 *cited in* Babor, et al., 2010). Babor and colleagues (2010) note that, for this reason, repeat offenders may require a more comprehensive approach to intervention/treatment.

12.2 Mass media campaigns

A systematic review of the effectiveness of mass media campaigns for reducing alcohol-impaired driving and alcohol-related crashes, found eight studies that met the quality criteria for inclusion in the review (Elder, et al., 2004). The median decrease in alcohol-related crashes across those studies was 13 percent.

The authors of the review found “strong evidence” that “mass media campaigns that are carefully planned, well-executed, attain adequate audience exposure, and are implemented in conjunction with other ongoing prevention activities, such as enhanced ... law enforcement, are effective in reducing alcohol-impaired driving and alcohol-related crashes” (p. 65). The authors also note that the studies reviewed suggest that such campaigns are cost saving.

While none of the studies in the review by Elder and colleagues provided sufficient evidence on their own that a given campaign actually reduced drink driving or alcohol-related crashes, across the whole body of evidence reviewed, “... which contains studies subject to confounding variables likely to be unique to the given situations observed, the estimated effects of the campaigns consistently indicated beneficial results. This pattern is unlikely to be an artifact of methodologic flaws in the studies evaluated, and suggests that the campaigns were in fact effective” (p. 63).

Elder and colleagues identify a number of aspects of mass media campaigns that may impact on their effectiveness.



- ◆ *Message content.* Common motivational themes to reduce alcohol-impaired driving include fear and consequences of arrest, positive social norms, fear of harm to self, others, or property, and stigmatising drinking drivers as irresponsible and dangerous. Actions promoted by campaigns vary from messages related to abstinence or moderation to specific behavioural recommendations such as using a designated driver. The authors note that "... decisions related to message content are generally made based on the opinions expressed by experts or focus groups rather than on evidence of effectiveness in changing behaviour" (p. 57).

The effectiveness of "fear-based" campaigns is debated in the research literature, with some level of anxiety arousal generally seen as a desirable motivator, although carrying some risk that people will be turned off by any message that invokes intense anxiety. Two campaigns reviewed by Elder and colleagues used fear-based messages.

- ◆ *Message delivery.* Important aspects of message delivery are control over message placement to ensure the intended audience is exposed to the message with sufficient frequency, and high production quality to maximise the probability that the audience will pay attention to the message, and that the message will elicit the intended emotional impact. Most campaigns in the review by Elder and colleagues used paid advertising (which helps in the retention of control of message placement).
- ◆ *Message pre-testing.* Pre-testing can establish which themes or concepts are most relevant to the target audience, and ensure that the target audience will attend to and comprehend the specific messages presented. Five studies in the review by Elder and colleagues used some form of pre-testing.

Babor and colleagues (2010) agree that message delivery is important and they point out that, in most cases, information campaigns are targeted at young people. They suggest that mass media campaigns targeting a universal audience are likely to have a more limited impact, particularly as an antidote to high quality pro-drinking messages that will probably appear much more frequently.

12.3 Engaging adolescents and young adults

In a report on road safety progress in New Zealand since 2000, the Ministry of Transport (2009) notes that "... there has not been an appreciable reduction in alcohol/drug-related crashes over the last 10 years, despite highly visible enforcement and an increase in the number of breath tests administered" (p. 3). Two relevant factors are suggested: population growth in the 15 to 19 years age group - this group made up a higher proportion of drivers involved in alcohol crashes in 2008 than in 2000, and the reduction in the minimum purchase age for alcohol from 20 to 18 years in 1999, meaning young drivers have had increased access to alcohol.

A cross-sectional study using data from the *Youth2000* survey examined the association between drink driving and the patterns and context of drinking among adolescents (3,308 secondary school students aged 15 years and over) who were both current drinkers and drivers (Tin, et al., 2008). Of the participants, just over 17 percent reported drink driving in the last month, and drink driving was significantly associated with frequent (at least weekly) alcohol use, binge drinking, and usually drinking away from home. However, the perception of adolescents that parents and schools cared



about them, parental monitoring and high academic achievement were associated with a reduced risk of driving while drunk. Having friends who drank alcohol increased the risk of driving while drunk. The authors conclude that interventions that build on positive connections to families and schools could be effective in reducing misuse of alcohol by adolescents.

12.4 Pedestrians

Regarding interventions to reduce pedestrian injury related to alcohol, the Ministry of Transport in New Zealand notes that "... It is difficult to develop countermeasures to prevent excessive drinking and walking. However, any changes to the infrastructure that increase the safety of pedestrians in general are also likely to increase safety for intoxicated pedestrians" (Ministry of Transport, 2010b).



13.0 Interventions for other settings/injury types

SUMMARY

Indicative research

Workplace injury

There is no clear evidence that alcohol-testing interventions are more effective than no intervention in reducing injuries in occupational drivers.

School and university-based programmes

There is no clear evidence that school or university-based programmes are effective in reducing alcohol-related injury.

Social norms feedback (presenting feedback on youth (mis)perceptions about how their peers drink, providing information about personal drinking profiles, risk factors, and normative comparisons) delivered via the internet or computer, or via individual face-to-face feedback appears to reduce alcohol misuse in university or college students.

Drowning

There is no clear evidence on the effectiveness of education or training on the dangers of alcohol when on or near the water in reducing the risk of drowning.

Fire

No evidence was identified on the effectiveness of education or training on the dangers of alcohol and fire.

13.1 Workplace injuries

In a review of the international literature, sponsored by ALAC, Kirkwood (2005) found “limited evidence to inform best practice with regard to workplace-based alcohol and other drug intervention in general and even more limited evidence specific to early intervention in the workplace” (p. 1).

Ramchand and colleagues (2009) identify interventions commonly used in workplaces (either in a mixed approach or alone), including workplace drug testing, Employee Assistance Programmes, education campaigns in the workplace, and changing social norms in the workplace.

13.1.1 Interventions for occupational drivers

A Cochrane systematic review was undertaken by Cashman and colleagues (2009) on the effects of alcohol and drug screening among occupational drivers with the aim of preventing injury. They identified two time-series studies conducted in the United States. One was conducted in five large transportation companies, and examined the effect of federally mandated random drug testing. The other was of a workplace, peer-focused substance abuse prevention and early intervention programme (PeerCare) evaluated in an interrupted time-series design from 1983 to 1996.



PeerCare is a workplace peer intervention programme implemented in the transport industry in the United States that involved the training of volunteer teams of union workers, using one to two day training courses on how to recognise, intervene with and refer a co-worker with a drinking or drug problem. Regression analysis found a significant association between the percentage of employees covered under PeerCare and injury rates, with every one percent increase in the workforce covered under PeerCare, resulting in a 0.16 percent decrease in the monthly injury rate. Once 86 percent of the workforce was covered, this meant an average reduction in injury rates of 14 percent per month (Spicer & Miller, 2005).

However, Cashman and colleagues report only limited evidence that, in the long term, mandatory drug-testing interventions can be more effective than no intervention in reducing injuries in occupational drivers. Regarding combined drug and alcohol testing, they note that, in the PeerCare programme, there was evidence of a decrease in the level of injuries immediately after the intervention, but no evidence of long-term change. As the peer-worker mediated workplace substance abuse programme was running at the same time as federally mandated random drug and alcohol testing programmes, the authors also note that the independent effects of the interventions are difficult to differentiate.

Spicer and Miller do address this in their evaluation of PeerCare, noting their methodology controlled for any confounding effects of the federal programmes. However, they confirm that, after 1989, declines in injury rates at the study company were only weakly associated with the PeerCare programme. Cashman and colleagues suggest more evaluation studies are required.

13.1.2 Employee Assistance Programmes and other interventions

Employee Assistance Programmes (EAP) generally provide assessment, short-term counselling/treatment services and referral to employees needing assistance for issues including health problems, financial troubles, emotional problems or substance abuse. Workers may request to participate in an EAP or may be referred by their employer.

A U.S. review suggests that Employee-Assistance Programmes are the most common type of intervention used within workplaces to address issues with alcohol (Ramchand, et al., 2009). Services are usually brief, and include evaluation, brief treatment, or outside referral, or a combination of these. However, Ramchand and colleagues note that the effectiveness of Employee Assistance Programmes in reducing substance use and related problems, including occupational injuries, has not been determined.

Ramchand and colleagues (2009) note that designing programmes and interventions to change drinking cultures in workplaces is “recognized as inherently difficult”. They go on to say that interventions that encourage workers to recognize substance-use problems in their co-workers may be considered educational in nature but may also either directly or indirectly encourage changes in social norms.



A workplace drug and alcohol programme, *Drugs and alcohol – Not at work, Be smart, stay sharp* (NAW), implemented in 2001 by New Zealand Post (in partnership with the Engineers', Printers' and Manufacturers' Union)²⁶, addressed the issue of unsafe work practices caused by drugs and alcohol. The programme aimed to teach employees to take responsibility for their own safety and the safety of their fellow employees through a peer-based safety programme (Bennett & Coggan, 2004). An evaluation of the programme in 2004 used key informant interviews, a survey of employees, focus groups with employee representatives, an analysis of organisational data on employee access to employee assistance programmes, and a critical review of programme documentation and support materials.

The evaluation found that the NAW model was a good fit with the broader development and sustainability of a workplace safety culture, implementation was perceived as a positive workplace partnership between the employer and the union, and the programme was acceptable to the majority of employees. Bennett and Coggan suggest that a focus on unsafe behaviours within a broader health and safety framework is seen as more appropriate by employees and managers and the programme was not challenged in the same way as workplace alcohol and drug testing. Bennett and Coggan conclude that the programme demonstrated potential for supporting improvements in workplace safety culture relating to unsafe behaviours, and alcohol and other drug misuse.

13.2 School and university-based programmes

No systematic reviews of school or university-based programmes that focus on reducing alcohol-related injury were identified. However, a recent review of evaluations of randomised controlled trials of universal school-based programmes for alcohol misuse in young people found that reporting quality for evaluations was poor (Foxcroft & Tsertsvadze, 2011). Although some studies reported significant improvements, particularly in drunkenness and binge drinking, others showed no effects, and the authors conclude that there are no particular characteristics that can be identified for the successful programmes.

A review undertaken in the UK investigated the effectiveness of interventions delivered in primary and secondary schools in preventing or reducing alcohol use in young people under the age of 18 years (Jones, et al., 2007)²⁷. The authors identified only one systematic review that specifically examined the effectiveness of programmes that aimed to prevent alcohol use (rather than substance use). This systematic review found no consistent evidence to determine which programmes were effective over the short to medium term, but highlighted three programmes which were effective over the longer term. However, as with the review by Foxcroft and Tsertsvadze, these programmes only evaluated the impact on alcohol use rather than injury (and the authors note that the applicability and transferability of these programmes requires further study).

²⁶ Based on an Australian programme: *Building Trades Group Drug and Alcohol Program* - <http://www.btgda.org.au/>

²⁷ The methodology followed National Institute for Clinical Excellence (NICE) protocols for the development of NICE public health guidance



Babor and colleagues (2010) review school-based alcohol education programmes and other prevention initiatives focused on adolescents. They describe the evolution of such programmes, beginning with the provision of knowledge on alcohol use (and later drug use) and its risks, which were found to be ineffective in changing substance use behaviour. The next phase focused on personal development, such as decision making, self-esteem and values clarification. These were also found to be ineffective. From the early 1980s the social influence model has been widely used in school-based programmes. The approach focuses on resisting social pressure to use alcohol and drugs, by focusing on short-term and immediate social consequences. Increasingly, normative education has also been used that corrects any misperceptions by adolescents about the numbers of their peers who are drinking, and who approve of drinking. Babor and colleagues note that there is inconclusive evidence on the impact of such programmes, with few studies considering impacts on injury and methodological issues affecting the credibility of other results.

A systematic review of school-based programmes that aimed to reduce drink and driving and riding with drinking drivers found that while there was sufficient evidence of the effectiveness of the programmes in reducing riding with drinking drivers, the evidence was insufficient to determine the effectiveness of programmes that aimed to reduce drink driving itself (Elder, et al., 2005). Those programmes that included refusal skills and other skill training, along with student interaction, were identified as the most promising approaches.

A Cochrane systematic review investigated whether social norms feedback reduces alcohol misuse in *university or college* students (Moreira, et al., 2009). This approach involves presenting feedback on youth (mis)perceptions about how their peers drink, providing information about personal drinking profiles, risk factors, and normative comparisons. Feedback may be given alone or in addition to individual or group counselling.

The systematic review was based on 22 randomised controlled trials, with a total of 7,275 college or university students assigned either to a social norms intervention or a control group (either no intervention, educational leaflets, or an alcohol educational session). The authors note that only a small number of good quality studies were available, and most of studies were from the United States (with the exception of three studies conducted in New Zealand).

Interventions that were delivered to students using the web or computer, or individual face-to-face feedback, appeared to reduce alcohol misuse. One of the New Zealand studies provides a good example of how an intervention might work. Students attending a student health service completed a computer survey, and those with an AUDIT rating over 8 were randomly assigned by computer to control or intervention. After completing the survey, students in the intervention group received a personalised feedback report, and assessment and personalised feedback were repeated at six months for the intervention group. The intervention group showed reduced alcohol consumption and fewer personal and academic problems, compared with the control group (Kypri, et al., 2008; Moreira, et al., 2009). Overall, the systematic review found there was no significant effect for mailed feedback, group face-to-face feedback or social norms marketing campaigns. There was no detail in the systematic review on whether one of the outcomes measured (“alcohol-related problems”) included injury (Moreira, et al., 2009).



13.3 Sport and recreation injuries

A Cochrane systematic review on policy interventions implemented through sporting organisations for promoting healthy behaviour changes covered policies surrounding the responsible use of alcohol (e.g. drink driving awareness programmes, alcohol server training and availability of low or non-alcoholic beverages), but excluded policies and practices surrounding sports injury prevention (such as padding for goal posts) (Priest, et al., 2008). The review found no rigorous studies evaluating the effectiveness of policy interventions organised through sporting organisations to increase healthy behaviours, attitudes, knowledge, or the inclusion of health-oriented policies within the organisations.

No robust research was identified on the effectiveness of brief intervention, education or training on the dangers of alcohol when on or near the water in reducing the risk of drowning. This appears to reflect a similar dearth of evaluations for general (i.e. non-alcohol-related) interventions to address drowning risk that measure the effects on the incidence of drowning. Driscoll and colleagues note that "... drowning has been called the 'final frontier' of injury prevention" (Driscoll, et al., 2004, p. 111).

Based on a review of the literature, Driscoll and colleagues (2004) conclude that research is required to evaluate the effectiveness of intervention programmes as, without rigorous evaluations, it is difficult to identify which interventions would be more likely to be effective in reducing the role of alcohol in drowning.

13.4 Fire and burn injuries

No robust research was identified on the effectiveness of brief intervention, education or training on the dangers of alcohol and fire.

Based on their investigation into behavioural factors involved in unintentional residential fire deaths in New Zealand (see Section 9.2.2), Miller and Beever (2005) note that while gains have been made from engineering and technological solutions, the integration of developmental, cultural, and socioeconomic factors is central to developing effective fire safety and prevention initiatives. The authors suggest that initiatives need to recognise key issues for targeted interventions, including the following:

- ◆ Different strategies will apply depending on where individuals fall on the developmental continuum, with initiatives targeting children needing to be different to those which apply to young adults or the aged.
- ◆ Recognition of different cultural and ethnic practices, with effective targeted interventions being developed from within different communities.
- ◆ An aggregation of economic, material, and social deprivation factors that are associated with those over-represented in fire statistics.



In a New Zealand strategic review of alcohol and fire, the authors consider technical, environmental and behavioural strategies to minimise the risk of fire associated with alcohol consumption (Stokes, et al., 2011). Behavioural strategies include advertising campaigns focused on raising awareness and changing behaviour, as well as education programmes.

The report recommends that the New Zealand Fire Service “... focus on their area of expertise in regards to technical strategies, and work in collaboration with government agencies on developing and implementing environmental and behavioural strategies” (p. 4). Stokes and colleagues go on to recommend that the New Zealand Fire Service work with other government agencies to deliver key messages through education and marketing campaigns, and particularly to at-risk groups. They note that, “[o]ften the people identified by a government agency as being ‘at-risk’ are the same across agencies. Therefore, it is important for the NZFS to work on collaborative community projects, and engage in legislation, policy and procedure development discussions in regards to alcohol” (p.5).



14.0 Interventions to alter the drinking context in licensed premises

“The high rate of problems in commercial drinking establishments make this drinking context a prime target for alcohol policies aimed at the prevention of alcohol-related problems” (Babor, et al., 2010, p. 146).

This section describes interventions implemented in drinking environments with the aim of reducing levels of alcohol-related injury and death.

SUMMARY

Authoritative research

There is no clear evidence that server training interventions implemented in alcohol server settings are effective in reducing injury. Mandated interventions may be more likely to show an effect.

Indicative research

There may be some potential for a stand-alone relatively brief training intervention to reduce severe and moderate physical aggression in bars.

The assumptions underlying the altering of the drinking context are that it will create environmental and social constraints that will limit alcohol consumption or the impacts of alcohol consumption, and therefore reduce alcohol-related injury (Babor, et al., 2010).

Legislation and enforcement of liquor laws are not within the scope of this review. Educational and environmental interventions in drinking environments can range from training and certification to tools to help improve drinking environments, and can focus on alcohol service itself or the problem behaviours that emerge from alcohol consumption.

14.1 Server training

Server training addresses the attitudes, knowledge, skills, and behaviour of people serving alcohol, with the main goals being to prevent intoxication and underage drinking. Babor and colleagues (2010) identify the following components as typically being part of a server training intervention:

- ◆ Attitude change: the benefits of preventing intoxication and not serving those who are under-age are stressed to encourage servers and managers to take responsibility.
- ◆ Knowledge: information is provided on the effects of alcohol, the signs of intoxication, relevant laws and regulations, strategies for dealing with intoxicated or underage drinkers, and refusing service.
- ◆ Skills: the ability to recognise intoxication, refuse service, and avoid problems when dealing with intoxicated patrons.



- ◆ Practice: checking age identification, refusing service, and arranging safe transport for intoxicated patrons.

Evaluations of some server training interventions have demonstrated an increase in skills and knowledge, and some have shown effects on serving practices and lower levels of patron intoxication (Babor, et al., 2010). On the other hand, Babor and colleagues note that other studies have not identified any measureable effect from server training on service to intoxicated patrons or on the levels of intoxication of patrons, or have shown mixed effects.

A systematic Cochrane review by Ker and Chinnock (2008) investigated the effectiveness of interventions implemented in the server setting for reducing injuries. Twenty studies met the inclusion criteria. However, the authors report that the overall methodological quality was poor, and only five studies measured the effect on injury (only one of these was randomised – see Section 14.2 below), with the others measuring the effect on behaviour.

One study that controlled before and after the intervention was a time-series analysis of a state-wide (Oregon) *mandatory* server training scheme. The one-day training course covered seven areas: effect of alcohol on the body; interaction effects of alcohol with other drugs (prescription and illicit); problem drinking and alcoholism; service laws; drinking and driving laws and legal liability issues; effective server intervention techniques; and alcohol marketing practices for responsible alcohol service. A standardised written test had to be passed by all participants to obtain a permit to serve alcohol.

After controlling for drink driving-related policy changes and the trend of crashes in the control area, it was estimated that the intervention led to a reduction in single-vehicle night-time, injury-producing crashes of four percent after six months, 11 percent after 12 months, 18 percent after 24 months, reaching 23 percent after 36 months. The study included single-vehicle night-time fatal crashes in 47 other states as a covariate. Crash data was collected for 11 years before the mandatory training policy and for two years after the introduction of the policy.

Ker and Chinnock conclude that their review produced “no reliable evidence that interventions in the alcohol server setting are effective in reducing injury”. Furthermore, they continue, “compliance with interventions appears to be a problem; hence mandated interventions may be more likely to show an effect. They also note that findings from studies were limited by their poor methodological quality (Ker & Chinnock, 2008, p. 2).



14.2 Glassware

The only randomised study identified by Ker and Chinnock that measured injury outcomes was one from the United Kingdom. The study compared the effectiveness of toughened glassware (intervention) and annealed glassware (control) in reducing bar-staff injuries. There was complete replacement of pint glasses in the intervention and control bars²⁸. In the 30 intervention bars, toughened glassware was used. In the 23 control bars, annealed glassware was used. A total of 1,229 (653 experimental and 576 control) questionnaires were completed and returned by bar staff. Unfortunately, results showed that the experimental toughened glass had lower impact resistance than the annealed glassware and caused *more* injury than the control. Seventy-two staff experienced injuries in the intervention bars, compared with only 43 staff experiencing injuries in the control bars, an approximately 70 percent greater risk of injury in the intervention group.

Another study that focused on glassware, investigated the impact of a glassware ban policy on disorder-related harm within licensed premises (nightclubs) (Forsyth, 2008). The ban was implemented across all venues in Glasgow city centre as part of a range of measures aimed at reducing violence in the city's night-time economy (other measures included restrictions on alcohol promotions, improved transport services, the encouragement of safer premises schemes, and social marketing designed to encourage sensible drinking. Prior to this policy's introduction, Glasgow had a high level of "glassings" (assaults using glass vessels as weapons).

Field observations conducted in a sample of eight nightclubs (selected from 70 in Glasgow) following the introduction of this policy used quantitative and qualitative data collection, observing violence in a naturalistic setting, and supplemented by taped in-depth interviews with 32 patrons. Exemptions to the ban meant three of the eight venues continued to use glass, and observations were also undertaken in these venues. Disorder in all-plastic venues was observed to incur less injury risk, and patrons also reported feeling safer in these nightclubs than in others. The authors note that 59 'glassings' were treated by Glasgow emergency departments in the year prior to the ban (37 had occurred in entertainment licensed premises) compared with only five incidents in the first six months after the ban.

A report on using design to reduce injuries from alcohol-related violence in pubs and clubs in the United Kingdom (Design & Technology Alliance Against Crime, 2011) suggests that the glassware ban in Glasgow (described above) alienated the licensed trade as well as many drinkers. They present research on the alternatives to glassware (strengthened glass, plastic and polycarbonate), and describe a trial in Northampton where, instead of a blanket ban, they targeted premises where glassware was being used as weapons. The nine largest venues in Northampton now only use polycarbonate glasses and many other pubs and bars use polycarbonate glasses at peak times and for special events. The authors report that the number of glassings and bottling that occur with the town centre has "significantly declined year on year from 51 in 2006 to 45 in 2007 and 31 in 2008. Since 2004, there has been a cumulative decrease of 40% in glassing incidents" (p. 32-33).

²⁸ Toughened glass is produced by rapid cooling of the glass after formation, producing an outer skin that holds the outer layer together. Annealed glass is cooled slowly to eliminate internal stresses, and propagation of flaws and cracks is more likely. Previous laboratory research has demonstrated that toughened glassware is more impact resistant and stronger than annealed glassware (Warburton & Shepherd, 2000).



14.3 Other interventions to address physical aggression in licensed premises

Babor and colleagues (2010) describe interventions that use both training and licensing to change the way that staff interact with difficult patrons, with the aim of preventing aggression and injury. They report that there is no evidence for the effectiveness of the licensing of door staff in preventing violence and, for this reason, they focus on the training of staff and programmes delivered as part of larger community action projects.

They note that most training programmes have never received even “minimal evaluation”. They describe one exception, the Safer Bars programme developed in Canada and directed at owners, managers and staff of licensed premises (Graham, et al., 2004; Graham, et al., 2008 *cited in* Babor, et al., 2010). The three-hour training programme focuses on the following:

1. Understanding how aggression escalates and how to intervene early.
2. Assessing the situation and working as a team.
3. Keeping cool.
4. Understanding and using effective body language.
5. Responding to problem situations and dealing with intoxicated individuals.
6. Legal issues relevant to preventing violence in licensed premises.

A randomised controlled study of the programme used 734 pre-post-intervention observations by trained observers on Friday and Saturday nights between midnight and 2am in 18 large capacity Toronto bars and clubs assigned randomly to an intervention group and 12 control bars (observations were made six months before and after intervention). In addition to 373 staff and owners/managers (84% participation) attending the three-hour training, owners/managers completed a workbook to identify ways of reducing environmental risks.

Analysis comparing pre- and post-aggression found that the intervention significantly reduced severe physical aggression by patrons (although the effect is described by Babor and colleagues as “modest”) (Graham, et al., 2004; Ker & Chinnock, 2008). Other research on the same programme found that bar staff and managers reported a high level of satisfaction with the training received, and there was a significant improvement in their knowledge and attitudes (Graham, et al., 2005). Babor and colleagues note that the effects of such programmes are likely to erode over time. Indeed, higher post-intervention aggression was associated with higher turnover of managers and door/security staff in intervention bars - the percentage of staff that received training and were still employed at the same bar ranged from 18.5 to 100 percent (Babor, et al., 2010; Graham, et al., 2004; Ker & Chinnock, 2008).

The Christchurch Central Business District Alcohol Accord was implemented from October 2006 to March 2007 to reduce alcohol-related violence and crime in the Christchurch central business district (Kirkwood & Parsonage, 2008). The aim was to develop a partnership approach between



agencies, licensees and other stakeholders, and a high level of engagement was achieved, with 42 licensed premises signing the Accord.

The Accord plan included a 3am one-way door on Thursday, Friday and Saturday nights and the aim of reducing crime and violence in the inner city by 10 percent. An evaluation of the planned one-way door component of the *Accord*, commissioned by ALAC and ACC, included a review of surveys and interviews of key stakeholders, and analysis of offence data. The researchers concluded that a change to the timing of the one-way door component from 3am to 4am, and licensed premises being allowed to operate a cover charge as an alternative to the one-way door, resulted in a significant compromise to the planned intervention. The goal of a 10 percent reduction in alcohol-related crime and violence in the inner city was not met, although there were reductions in some relevant sub-sets of crime, such as serious violence offences on Saturday and Sunday nights. There was some impact on perceptions of safety and crime levels, and relationships between stakeholders were significantly improved. Critical success factors were identified as effective working relationships and a shared vision by stakeholders.



15.0 Multi-component interventions with community mobilisation

“Research on local prevention efforts suggests that alcohol problems are best considered in terms of the community systems that produce them. Local strategies have great potential to be effective when prior scientific evidence is used and multiple policies are implemented in a systematic way” (Babor, et al., 2010, p. 251).

Multi-component programmes are interventions and policies implemented in multiple settings, often in tandem with community mobilisation (community coalition or taskforce actively involved in making decisions about the interventions and engaged throughout implementation) (Shults, et al., 2009).

SUMMARY

Authoritative research

Multi-component programmes have been identified as the approach showing the clearest evidence of effectiveness to date in reducing harm in drinking environments, including violence and traffic crashes.

These programmes combine community mobilisation, responsible beverage service training, house policies and stricter enforcement of licensing laws. Community engagement and mobilisation are important factors in the implementation of such programmes, along with the inclusion of a range of stakeholders, an emphasis on local planning and “ownership”, and prevention strategies designed with long term institutionalisation in mind. Findings on multi-component studies are limited by methodological shortcomings. It can also be difficult to separate the impacts of the different components of the programme and their effect on injury rates.

A systematic review of effective approaches to reducing harm in drinking environments, including violence and traffic crashes, identified 39 studies for inclusion that had been published since 1990 (Jones, et al., 2011). It was found that the “clearest indication of effectiveness” emerged from multi-component programmes. These programmes combine community mobilisation, responsible beverage service training, house policies and stricter enforcement of licensing laws. Community engagement and mobilisation were identified as important factors in the implementation of such programmes, along with the inclusion of a range of stakeholders, and an emphasis on local planning and “ownership”.

Jones and colleagues point to the STAD project (Stockholm Prevents Alcohol and Drug Problems), a programme targeting licensed premises in Sweden, as providing the “clearest indication of effectiveness”, with evaluations undertaken of both its effectiveness in reducing violent crime and its cost-effectiveness.

STAD was a ten-year community action project that began in 1996 and involved the authorities and the hospitality industry working together to address alcohol-related problems in drinking environments, using a combination of community mobilisation, responsible server training and enforcement (Jones, et al., 2011; Wallin, et al., 2003). During the period of the intervention there were significant reductions in reported violent crimes (including assaults, illegal threats and harassment, and violence and threats targeted at officials, including police and door staff),



occurring between 10pm and 6am. Within a control area there was a slight increase in reported crimes during the same period, and this was also the case for the national level of crime.

Babor and colleagues (2010) also discuss the success of the STAD programme, noting that it was structured as a ten year project and the effects appeared to increase over time. They particularly highlight its long timeframe, support from critical stakeholders and sustained police enforcement as critical success factors. They recommend that prevention strategies designed with long term institutionalisation in mind should be favoured over those only in place for the life of a project. Babor and colleagues point to positive impacts on violence being achieved in at least two community action programmes (including STAD). However, they also describe a similar programme that failed to achieve consistent reductions in violence. They suggest that it is hard to isolate the effects of the different programme components and that the success of such projects depends on their quality and context.

A community-based programme targeting alcohol and illicit drugs in the municipality of Trelleborg, Sweden was put into action in 1999 and continued for 36 months (Stafström & Larsson, 2007; Stafström & Östergren, 2008). The authors of an evaluation of the programme note that local contextual factors are often related to different levels of alcohol-related injuries and accidents in communities and that, for this reason, it makes sense that community-based interventions are used to address these issues (Stafström & Östergren, 2008).

The Trelleborg project had a range of components: adoption of a community policy and action plan on alcohol and drug management by the city council; council approval of a school policy and action plan on alcohol and drug management; development by the police and city administration of a cross-sectoral approach to inspecting stores where black market alcohol might be sold; an evidence-based curriculum on alcohol and drugs introduced in all primary and secondary schools (including a textbook supporting problem-solving and value-oriented group discussions); all parents of 7th graders were mailed a leaflet on promoting an alcohol and drug free adolescence; and a survey of adolescent alcohol and drug use in the community was publicised in the local media.

Cross-sectional data was obtained from four surveys (1999, 2000, 2001, and 2003) of 9th graders (15-16 years)²⁹ at public schools in Trelleborg. The authors excluded data from 330 abstainers and analysed data from 1,046 students. There were significantly less reported alcohol-related accidents in 2003 than there had been in 1999. Self-reported alcohol-related violence had also decreased but this decrease was not statistically significant. Analysis also showed that these decreases were likely to be a result of a reduction in excessive drinking and, to a lesser extent, a reduction in the frequency of distilled spirits consumption.

Discussing the use of a community systems approach in the Trelleborg project, Holder (2006) suggests that no single intervention would have sufficient strength to cause a population-level reduction in heavy drinking or a lower level of alcohol problems. He goes on to say that the comprehensive approach increased the overall strength of the intervention and provided an environment in which individual strategies could be mutually supportive of one another. Babor and

²⁹ The legal age for drinking was 18 years.



colleagues (2010, p. 251) agree, saying that “... a complementary system of strategies that seek to restructure the total drinking environment is more likely to be effective than single strategies”.

One of the challenges for the Trelleborg project was ensuring projects didn't get mired in bureaucratic processes, while still maintaining the involvement of civil servants and politicians in the decision-making to ensure the project wasn't marginalised (Stafström & Larsson, 2007). Jones and colleagues note that few of the studies in their review discussed issues and barriers experienced when implementing interventions, although a need to gain management support was identified as a barrier in one server training programme. The authors also point to gaps in the understanding of drinking behaviours and alcohol-related harm, particularly for young adults, which need to be addressed to inform future interventions.

Another systematic review investigated the effectiveness of multi-component programmes, with community mobilisation, specifically for reducing alcohol-impaired driving (Shults, et al., 2009). Six studies fulfilled the criteria for the review, all of which were implemented in the United States between 1988 and 2001. Two had time-series designs with concurrent comparison, two were before and after trials with concurrent comparison, and two were group randomised trials. All six programmes implemented responsible server programmes, and programmes to limit access to alcohol, such as enforcement of minimum legal drinking laws or controlling alcohol outlet density. Five used sobriety checkpoints, along with public awareness/education campaigns, two addressed other risks, such as speeding, and one increased access to treatment for alcohol-related issues.

Two of the studies reported declines of nine percent and 42 percent in fatal crashes, one study reported a decline of ten percent in injury crashes, another study reported a decline in crashes involving young drivers aged 16 to 20 years. Shults and colleagues conclude that there is “strong evidence” that well-planned, and well-executed multi-year, multi-component programmes, with community mobilisation can reduce alcohol-related crashes.

However, Shults and colleagues also note that their research doesn't answer the question of whether community mobilisation increases the effectiveness of multi-component interventions, and also acknowledge the challenges that community coalitions face, for example in gaining consensus and the tendency of coalitions to favour “less-effective” interventions, such as public education because this causes less disruption to social and economic interests in the community.

Jones and colleagues (2011) point to the findings from multi-component studies being limited by the methodological shortcomings of the studies. They suggest future evaluations should focus on using appropriate designs and should provide detailed descriptions of the interventions, including information on transferability. It can also be difficult to separate the impact of the different components of the programme and their effect on injury rates.



16.0 Discussion

This review focuses on research that specifically considers the role of alcohol in causing injury and the effectiveness of educational and environmental strategies in preventing alcohol-related injury. It should be read in the context of other research on the effectiveness of policies and interventions directed at alcohol-related harm generally, including taxation, regulations, enforcement, and the development of effective treatment services.

The review aims to provide a clear overview of the state of current research, and enable strengths and gaps in the current evidence base to be identified.

A number of clear associations have been made about the relationship between alcohol and injury including the following:

- ◆ There is a clear association between acute alcohol consumption (and also a probable smaller relationship between chronic alcohol use and injury although this has not been clearly defined).
- ◆ There is a dose-response relationship, with the risk of injury increasing as the amount of alcohol consumed increases, although the risk of injury levels off at higher levels of consumption.
- ◆ The risk of injury begins at low levels of consumption.
- ◆ Males and young people are over-represented in the incidence of alcohol-related injury.
- ◆ The magnitude of the relationship between alcohol and violent injuries appears to be significantly higher than for other injury types.
- ◆ A causal relationship has been identified between alcohol and violent injuries, road traffic injuries and injuries from falls, and there is substantial evidence that alcohol plays a role in fire fatalities. The evidence for other injury types is less clear.

However, it is less easy to find answers to some of the more detailed questions asked in the scope of this review. While there is information available on some predictors of injury, such as location of drinking, and levels of intoxication, there is little or no authoritative research on the reasons for drinking, detail on the patterns of drinking, and the length of the risk period after drinking.

The evidence for the effectiveness of interventions to reduce the incidence of alcohol-related injury is also limited. Most of the research has focused on the effectiveness of brief interventions, primarily in the locations where alcohol-related injuries are most likely to be seen – the emergency department.



While there is substantial evidence to support the effectiveness of brief interventions in primary care settings to reduce alcohol consumption and associated problems, there is no clear evidence on the impact of these brief interventions on the incidence of injury. The evidence for similar interventions in emergency departments is limited, but encouraging.

In emergency department settings, brief interventions have been associated with approximately half the odds of experiencing an alcohol-related injury (no clear evidence has emerged from studies in other hospital settings). However, this is based on a small number of studies and successful outcomes are not inevitable. It is also not clear how any positive effects are mediated as they are not necessarily a product of reduced alcohol consumption. There is some evidence to suggest that patients who causally attribute their injury to their alcohol use might be more motivated to change their behaviour.

Further research has been suggested in areas such as the impacts of brief interventions on different types of injury and different levels of severity of injury, and on factors that influence the efficacy of brief intervention in emergency departments, such as characteristics of the patient, characteristics of the counsellor, characteristics of the intervention and characteristics of the setting.

There was evidence to support the effectiveness of mass media campaigns to reduce alcohol-impaired driving and alcohol-related crashes. However, it is emphasised that such campaigns should be well-planned, well-executed, attain adequate audience exposure and be implemented in conjunction with other ongoing prevention activities, such as enhanced law enforcement.

Indeed, multi-component programmes are identified as the approach showing the clearest evidence of effectiveness to date in reducing harm in drinking environments, including violence and traffic crashes. These programmes combine community mobilisation, responsible beverage service training, house policies and stricter enforcement of licensing laws.

Community engagement and mobilisation are identified as important factors in the implementation of multi-component programmes, along with the inclusion of a range of stakeholders, an emphasis on local planning and “ownership”, and prevention strategies designed with long term institutionalisation in mind. Findings are limited by some methodological shortcomings, and it can be difficult to separate the impact of the different components of programmes and their effect on injury rates. It has been suggested that a comprehensive approach may contribute to increasing the overall strength of interventions and provided an environment in which individual strategies could be mutually supportive of one another.

There was no information identified for this review on how changed behaviour influences the causal sequence of injuries or the risk of injury.

What is apparent from the literature reviewed is that while there is a broad understanding of the role of alcohol in injury, the mechanics of that relationship are not well understood, and the development of interventions to reduce the impact of alcohol consumption on the incidence of injury is in its infancy.



Appendix 1 Key information sources

INTERNATIONAL RESOURCES

Global Information System on Alcohol and Health (www.who.int/globalatlas/alcohol)

Includes data on more than 200 alcohol-related indicators, arranged under a broad set of seven categories that contain indicators chosen to assess the alcohol situation in World Health Organization member states (related to public health). The categories are: alcohol production and availability; levels of consumption; patterns of consumption; harms and consequences; economic aspects; alcohol control policies; and resources for prevention and treatment. This information system is the source for most of the data in the report, *Global status report on alcohol and health* (World Health Organization, 2011).

Global School-based Student Health Survey (www.cdc.gov/gshs/)

A collaborative surveillance project designed to help countries measure and assess the behavioural risk factors, including alcohol use, and protective factors in ten key areas among young people (aged 13 to 15 years). Note: to date, New Zealand does not appear to have implemented this survey.

WHO Global Burden of Disease Study (www.who.int/topics/global_burden_of_disease/en/)

A comprehensive and comparable assessment of mortality and loss of health from diseases and injuries. The project draws from a wide range of data sources, with alcohol use included as a risk factor.

NEW ZEALAND DATABASES AND SURVEYS

DATABASES

National Injury Query System (<https://blogs.otago.ac.nz/ipru/statistics>)

An online injury query system which allows users to produce numbers and rates of injuries in New Zealand based on parameters of interest, such as years, age groups, geographic area, cause, or intent. A fatal query enables the user to determine the number and rate of injury deaths in New Zealand based on coronial records. A non-fatal query covers injuries that result in admission to public hospitals in New Zealand. A customised enquiries service is also available.

Drownbase™ (<http://www.watersafety.org.nz/drownbase/>)

Water Safety New Zealand collects information on all drownings in New Zealand in their DrownBase™ database. Fact sheets informed by this data are provided by: activity (boating, fishing, immersion incidents, underwater, water sport); environment (beaches, domestic, home pools, inland still waters, offshore, public pools, rivers, tidal waters); demographics (gender, age groups and ethnicity); and region. In many of these, the percentage of incidents where alcohol was “involved” is given.

Alco-Link

Alco-Link is an operational police database that helps to map the relationship between alcohol and offending, including the locations where people drink before committing an offence. The purpose of Alco-Link is to reduce alcohol-related crime and crashes associated with consumption of alcohol on licensed premises. Whether alcohol is a factor in an incident is ascertained either by the alleged offender informing police that they consumed alcohol prior to offending and, if unresponsive, the arresting officer judging alcohol involvement based on physical and behavioural cues. Information is collected that identifies the alleged place of last drink, and the level to which the offender was affected by alcohol, as perceived by police at the time of arrest. Information is not systematically collected for victims, suspects or people involved in incidents that do not end in an arrest.

Fire Service database

The New Zealand Fire Service has a database on fire fatalities. This database includes information on blood alcohol levels at the time of autopsy, and if available, it records any known history of alcoholism or drug taking.



SURVEYS

2007/2008 Alcohol and Drug Use Survey³⁰ (<http://www.health.govt.nz>)

Provides detailed information about alcohol and illicit drug use among 6,784 New Zealanders aged 16 to 64 years using a stratified sample design, with increased sampling of Māori and Pacific peoples (1,825 Māori and 817 Pacific respondents). Also includes data on patterns of alcohol use, drinking behaviours, risky behaviours while under the influence of alcohol, use of moderating drinking behaviours, help-seeking behaviours, harmful effects from alcohol use, and harmful effects experienced due to someone else's alcohol use. Data specific to Māori, Pacific peoples, youth, and high deprivation neighbourhoods are also available.

STATISTICS

Motor Vehicle Crashes in New Zealand

(<http://www.transport.govt.nz/research/motorvehiclecrashesinnewzealand/>)

An annual statistical statement on road crashes in New Zealand produced by the Ministry of Transport. Crash data are derived from Traffic Crash Reports completed by police officers who attend fatal and injury crashes. The detailed information about crash circumstances and causes is extracted and stored in the Ministry's Crash Analysis System. Includes statistics on blood alcohol levels of fatally injured drivers, and statistical details of the crashes in which they were involved, as well as some comparative data from previous years.

Alcohol and Drugs Crash Facts 2010 (<http://www.transport.govt.nz/research/Alcohol-and-drugs/>)

Published by the Ministry of Transport and provides the latest summary of alcohol and drug-related crash data, including comparisons with data going back to 1989.

Monthly crash statistics

(<http://www.transport.govt.nz/research/Pages/MonthlyOverviewofCrashStatistics.aspx>)

Published by the Ministry of Transport and includes the number and percentage of drivers killed with excess alcohol, with comparison data available back to 2000.

READINGS ON THE RELATIONSHIP BETWEEN ALCOHOL AND INJURY

Alcohol: No ordinary commodity - Research and public policy (Babor, et al., 2010), published by Oxford University Press, is a collaborative effort by an international group of addiction scientists and aims to improve the linkages between addiction science and alcohol policy.

It presents the accumulated scientific knowledge on alcohol research that has a direct relevance to the development of alcohol policy on local, national, and international levels. The authors present epidemiological data on the global dimensions of alcohol misuse, and provide a critical review of the cumulative scientific evidence in seven general areas of alcohol policy: pricing and taxation, regulating the physical availability of alcohol, modifying the environment in which drinking occurs, drinking-driving counter-measures, marketing restrictions, primary prevention programmes in schools and other settings, and treatment and early intervention services.

Alcohol and injuries: Emergency department studies in an international perspective (Cherpitel, et al., 2009), published by the World Health Organization, synthesises the results of a number of hospital emergency department studies conducted in different cultural and health care settings, including the WHO Collaborative Study on Alcohol and Injuries.

It provides an introduction to the epidemiology of alcohol-related injuries and describes methodological issues in emergency department studies. It addresses public policy implications and aims to provide practical information on interventions that can be implemented in emergency departments, such as screening and brief interventions for hazardous and harmful drinking.

³⁰ Previously the *New Zealand Health Survey* consisted of individual surveys conducted once every three or four years. The wider survey programme also included nutrition surveys, tobacco, alcohol and drug use surveys, a mental health survey, and an oral health survey (Ministry of Health 2009). From 2011 the *New Zealand Health Survey* and the wider survey programme will be integrated into a single survey.



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