



*National  
Drug Strategy*

## National Alcohol Research Agenda



National Alcohol Research Agenda

March 2002

# **National Alcohol Research Agenda**

MARCH 2002

A supporting paper to the  
National Alcohol Strategy  
*A Plan for Action 2001 to 2003-04*

© Commonwealth of Australia 2002

ISBN 0642820244

This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced by any process without prior written permission from the Commonwealth available from the Department of Communications, Information Technology and the Arts. Requests and inquiries concerning reproduction and rights should be addressed to the Manager, Copyright Services, Info Access, GPO Box 1920, Canberra ACT 2601.

Publication approval number: 3027

The opinions expressed in this document are those of the authors, workshop and meeting participants and are not necessarily those of the Commonwealth. This document is designed to provide information to progress alcohol research in Australia for use by government, non-government, industry and community organisations.

Additional Copies can be obtained by:

Mail: Drug Strategy and Health Promotion Branch  
MDP 27 Commonwealth Department of Health and Ageing  
GPO Box 9848, CANBERRA ACT 2601

Website: <http://www.health.gov.au/pubhlth/publicat/drugs.htm>

Publications Production Unit (Public Affairs, Parliamentary and Access Branch)  
Commonwealth Department of Health and Ageing  
Canberra

# Contents

|  |     |
|--|-----|
| Introduction   | 1   |
| Part One   |     |
| Alcohol research—the context   | 3   |
| Part Two   |     |
| Alcohol research—principles and priorities   | 7   |
| Part Three   |     |
| Background papers for the March workshop   | 13  |
| Patterns of alcohol use in Australia   | 13  |
| Acute alcohol-related harm in Australia  | 25  |
| Long-term consequences of alcohol consumption  | 41  |
| Prevention of alcohol-related harm: public policy and health   | 57  |
| Prevention of alcohol-related harm: early childhood and adolescent risk and protective factors   | 75  |
| Prevention of alcohol-related harm: community-based interventions  | 91  |
| Interventions for alcohol dependence, abuse and excessive drinking   | 113 |
| Assessment of the cost effectiveness of research or intervention recommendations from papers commissioned for the National Alcohol Research Agenda Workshop    | 125 |
| Epidemiological considerations relevant to the appraisal of recommendations arising from papers commissioned for the National Alcohol Research Agenda Workshop | 137 |
| Appendices   |     |
| Appendix 1: Summary of workshop presentation   | 151 |
| Appendix 2: Workshop Participants  | 154 |
| Appendix 3: Forum Participants   | 157 |



# Introduction

## Purpose

The National Alcohol Research Agenda provides a national blueprint for alcohol research that is broad-based, concise and accessible to a wide range of groups and individuals interested in alcohol research. The Agenda is intended to inform and provide a resource for State and Federal governments, researchers, non-government organisations and funding bodies, universities, local government, the alcohol industry, employers, law enforcement, the health sector, the insurance industry and the general community. The Agenda includes a set of principles to guide the identification and assessment of future alcohol research priorities.

The National Alcohol Research Agenda aims to support national policy and programs relating to alcohol and alcohol-related harm within the context of the National Alcohol Strategy. The research priorities will help funding bodies and researchers to direct alcohol research to those areas of greatest need and greatest potential, and will support accountability and program effectiveness.

At this stage, the Agenda focuses on social and health-related alcohol research and explicitly excludes bio-medical research. It is, however, intended to be flexible, and the fundamental principles and research headings it targets may change in response to future needs and changed circumstances in the community.

## The development of the National Alcohol Research Agenda

The National Alcohol Research Agenda is the outcome of a comprehensive process of broad ranging consultation, drafting, redrafting and refining, which commenced at the workshop on 27-28 March 2001 in Adelaide. The resultant set of research priorities and research principles have wide agreement and support across the alcohol field.

## Background Papers

Initially, seven background papers were commissioned from experts in various areas of

alcohol studies, to summarise the current state of knowledge and make research recommendations relevant to the area of each paper. These recommendations were then used in two further commissioned papers to illustrate two approaches to setting priorities. One paper took an economic/cost-effectiveness approach, the other an epidemiological approach. There are a number of other possible approaches to priority setting, and the authors emphasised the need to take a wider view in judging the value of research proposals.

These nine papers form Part Three of this document.

## Workshop Participants

The papers provided a common knowledge base and starting point for a widely representative workshop that was held in March 2001. The workshop brought together over eighty invited opinion leaders from the fields of drug and alcohol research, public health, the alcohol beverages and hospitality industry, drug and alcohol services, law enforcement, corrective services, nutrition, nursing, criminology, Veterans' Affairs, mental health, adolescent health, women's health, and in relation to Aboriginal and Torres Strait Islander peoples, representatives from health, corrective services, and economic and policy research.

Workshop participants are listed in Appendix Two.

## Workshop aims

The aims of the workshop were to:

- develop a framework for funding in policy-relevant alcohol research in the context of the National Alcohol Strategy's key strategic areas; and
- place alcohol research further up on the national health agenda to reflect the contribution of alcohol to the burden of disease, and on the broader national agenda, to reflect the impact of alcohol on a wide range of social issues including crime and law enforcement, education, and social policy.

## Development of research principles and priorities

Workshop participants were asked to take a broad perspective, beyond their own particular area of interest, to:

- develop a set of principles to guide priority setting, providing for a consistent, sensible, evidence-based approach and leading to productive alcohol research in Australia; and
- set broad priorities and goals within these principles, and create specific plans for achieving them.

A draft set of principles for priority setting was presented to the workshop, discussed in small groups, and refined to form the agreed principles presented in this document (see page 7). Research priorities in specific areas were also discussed, initially in small groups, then at a plenary session, using these principles and taking the recommendations from the background papers as a starting point.

The research recommendations that resulted from this process were brought together in a draft document, and subsequently subjected to further scrutiny by a smaller project reference group comprising a range of practitioners, researchers and policy makers in the drug and alcohol field, including police and industry.

Reference group members are listed in Appendix Three.

Consultation on the draft research recommendations was undertaken initially on a one-to-one basis, then at a forum held in Adelaide on 30 August 2001. This work was undertaken by the National Centre on Education and Training on Addiction at Flinders University, Adelaide, under the direction of Professor Ann Roche, and the outcome of that process was the research recommendations in this report.

The Research recommendations are provided in Part Two.

# Alcohol research — the context

## National policy

The National Alcohol Research Agenda has been developed in the context of a number of policy frameworks and initiatives that contribute to the reduction of alcohol-related harm. These span the full range of public health and broader social policy. Coordinated action across national strategies and programs ensures integration and consistency and avoids duplication.

In particular, the National Drug Strategic Framework aims to improve health, social and economic outcomes by preventing the uptake of harmful drug use and reducing the harmful effects of licit and illicit drugs in Australian society. Its objectives include the promotion of evidence-based practice through research, professional education and training; and the establishment of mechanisms for the cooperative development, transfer and use of research among interested parties<sup>1</sup>.

**The National Alcohol Strategy** has three primary aims:

- to reduce the incidence of premature mortality, and acute and chronic morbidity (disease and injury);
- to reduce social disorder, family disruption, violence (including domestic violence), and other crime, related to the misuse of alcohol; and
- to reduce the level of economic loss related to misuse of alcohol (including loss to individuals, communities, industries, and Australia as a whole).

The Strategy specifies the need for an alcohol research agenda, and one of its objectives is the promotion and uptake of evidence-based practice through research<sup>2</sup>.

## Social determinants of health

Alcohol research needs to be considered within a broader context of social and structural issues and determinants of health. It has been demonstrated that social support and good social relations make an important contribution to health. At the population level, both physical and mental health status are clearly linked to and influenced by a range of broad psychosocial and environmental factors including income, employment, poverty, education and access to community resources<sup>3</sup>.

Alcohol-related problems have many antecedent factors in common with issues addressed in a range of other national policy areas, including crime prevention, suicide prevention, homelessness, and mental health promotion and prevention. It is neither possible nor desirable to separate the causal pathways and antecedent conditions for many of these problems.

There is, therefore, a need to develop ways to integrate research, policy and intervention initiatives across such areas, as well as across the substance abuse field itself. This will involve interdisciplinary work and partnerships to aggregate intellectual and financial resources. In particular, effective integration will depend on the development of a common language and common frameworks, with a readiness to share and cooperate, and a belief in the value that will accrue. At the same time, there is a need to respect and support the factors and initiatives unique to alcohol.

## Alcohol beverage and hospitality industries

Within the alcohol beverage and hospitality industries there is wide recognition that light to moderate consumption of alcohol can provide

<sup>1</sup> Commonwealth of Australia (1998) National Drug Strategic Framework 1998-9 to 2002-3, page 19

<sup>2</sup> Commonwealth of Australia (2001) National Alcohol Strategy: A Plan for Action 2001 to 2003-4, page 39

<sup>3</sup> Wilkinson R, Marmot M (1998) Social Determinants of Health: The Solid Facts. World Health Organization. Kawachi I, Marmot MG (1998) Commentary: what can we learn from studies of occupational class and cardiovascular disease. American Journal of Epidemiology, 148(2), 160-3.

beneficial health effects, and that the majority of issues are related to alcohol misuse. The alcohol beverage industry is increasingly mindful of its social responsibility and the problems that arise from the misuse of alcohol, and it has established internal and external research and other policies to address these issues. The National Alcohol Research Agenda recognises, however, the importance of the independent regulation of the manufacture, sale and supply of alcohol in order to protect public health and safety.

### Directions in Australasian policing

In both the funding and operation of police services, the trend is towards a whole-of-government approach. At the same time, the Australian community is increasingly demanding policing services that are well coordinated, intelligence-led, problem-oriented, and responsive to local community needs. In order to meet this demand, police are continually seeking to consolidate the evidence base upon which their practice is built. Research is a key part of this process and its importance is reflected in the document, *Directions in Australasian Policing July 1999-June 2002*. Given the impact that alcohol has on crime and disorder, and therefore on policing, in Australia, alcohol-related research is highly relevant to this process.

### Rural health

Marked differences are seen across regional, rural and remote Australia in the health status of populations and in their access to and utilisation of health services. The lack of regional data describing alcohol-related issues hinders the planning and development of intervention and prevention strategies and services to reduce these differentials.

### Resourcing and infrastructure

The March workshop identified a pressing need to achieve a level of resourcing for alcohol-related research that is commensurate with the health, social and economic impact of alcohol-related problems in Australia. Such resourcing needs to come from a range of sources. Furthermore, every funding and auspicing body should be composed of people who are sufficiently aware of the exigencies of research that they would fund in a realistic way, not only in terms of the level of funding, but also the time constraints imposed.

### High Risk Groups

Research both with Aboriginal and Torres Strait Islander communities, and with culturally and linguistically diverse communities, will not be effective unless it is based on thorough consultation and negotiation with, and involvement of, the community in question. Developing a research proposal in these areas thus takes time, and the research then needs to evolve out of this process with a sense of continuity. A long wait for funding approval disrupts continuity and erodes community commitment to and confidence in the research process.

For many Aboriginal people, English is a second or third language, and this increases the time needed for effective consultation. Cultural and language issues also substantially increase the time needed to carry out the research sensitively and effectively.

Similar issues apply in research with people of different cultural and linguistic backgrounds. It is both the lead time, and the lag time between submission of research proposal and availability of funding, that are problems.

### Harm reduction

The March workshop identified the need for the research agenda to be based on a clearly identified and articulated theoretical basis, which will underpin the direction taken in research, as well as policy, service planning and service delivery. The National Drug Strategy's overriding theoretical framework in addressing substance abuse is harm reduction.

### Defining and assessing "harm"

Alcohol-related harm is commonly understood to encompass a range of readily measurable health effects, the immediate effects of intoxication (violence, accidents, public nuisance), and workplace effects such as absenteeism. The March workshop highlighted the need to broaden this understanding to include less easily measurable effects such as family disruption, relationship troubles, and child neglect and abuse, which have profound and long-lasting social, psychological, educational and economic consequences.

## Dissemination and evaluation

The March workshop emphasised the critical importance of dissemination and evaluation of research products:

- The fundamental aim of research in the alcohol field must be to improve services and make a difference for both individuals and societies. Informed policy development is a step towards achieving this. Mechanisms need to be established to ensure that research results are actively disseminated, and the results applied by those engaged in the reduction of alcohol-related harm.
- If research is to demonstrate credibly its intent to improve service delivery and outcomes, it must be embedded in an evaluation framework.

## Research Gaps

A recurring theme of the March workshop was that research conducted to date has been predominantly descriptive epidemiological studies. This research is clearly of importance, as this is one area where it is very difficult to generalise from the results of overseas studies. Nevertheless, the National Alcohol Research Agenda also identifies a need for further work in the following areas:

### Indigenous issues

Alcohol-related harm is an issue of great concern for Indigenous Australians. Additional processes are in place to develop further priorities for research on this topic, including those involving

National Expert Advisory Committee on Alcohol and the National Drug Strategy Aboriginal and Torres Strait Islander Peoples Reference Group.

### Biomedical research

While the National Alcohol Research Agenda focuses on social and applied health research, basic biomedical research is nevertheless an important element of a comprehensive alcohol research agenda. It will also be important to link relevant advances in basic science and intervention development with an evolving applied agenda. There is, therefore, a need for another group such as the National Health and Medical Research Council to address an agenda for relevant biomedical research, including early-phase trials.

### Law enforcement

Alcohol-related crime and disorder and other social and environmental harms represent very significant issues for the Australian law enforcement sector. Police expend substantial resources in dealing with these issues. They are also well placed to intervene to prevent a number of these problems from occurring. The research base that informs policing responses to alcohol-related harms is not as well developed as that of other sectors, and the Australian community is likely to derive significant benefit from research that can both identify the most effective strategies for police and highlight barriers that stand in the way of their adoption.

# Alcohol research principles and priorities

## Principles for setting priorities in research

1. The research proposal should:
  - be feasible
  - be soundly designed with a strong theoretical foundation and/or rationale
  - build on existing evidence where possible
  - be set in an appropriate timeframe for planning, execution and dissemination
  - be consistent with national frameworks and strategies
  - be ethical and sensitive to community needs
  - where appropriate, utilise international best practice.
2. The research should aim to fill important gaps and to progress knowledge to inform policy and practice.
3. The research should work across sectors and disciplines and involve appropriate collaboration with stakeholders including affected communities.
4. Validated measures including burden, health gain, clinical significance, practicality and cost effectiveness should be applied whenever possible. The potential impact on factors such as morbidity, mortality, human rights and community knowledge and attitudes should be taken into account.
5. Research priorities should reflect the overall burden on the Australian community and the particular needs of at risk groups.
6. Research with Aboriginal and Torres Strait Islander peoples should contribute to the overall understanding and practical resolution of alcohol problems.
7. The research design should match the questions being investigated and be sensitive to the broader needs of the participating individuals and communities. As an example, funding decisions

should take account of the need for diversity in research type (eg qualitative, descriptive, action oriented, basic, etc) and different research disciplines (eg social, biomedical, clinical, economics, education, treatment, services, prevention, legal).

8. New research directions should not compromise the funding of existing research areas that have continuing value. Multiple funding sources are to be encouraged.
9. Research should incorporate explicit strategies for dissemination of results.

## Research priorities

The research priorities that comprise the National Alcohol Research Agenda are grouped under three broad headings:

- Patterns of risk, use and harm - measuring and monitoring;
- Interventions;
- Dissemination and utilisation.

### Patterns of risk, use and harm

#### Measurement

##### Indicators of alcohol-related harm

- Further develop local, state and national indicators of high risk consumption and alcohol-related harm in order to facilitate rigorous evaluation of policy changes.
- Incorporate into drinking surveys information on the speed of drinking
- Develop measures and investigate prevalence of various social harms.
- Develop a practical scale for identification of high risk licensed premises.
- To facilitate the reporting on indicators of alcohol-related harm, collect data on:

- per capita alcohol consumption with provision for breakdowns by State and Territory, by country versus urban regions, and by beverage type to enable the calculation of estimates of the prevalence of low, medium and high risk drinking levels in the general population in relation to both acute and chronic harm;
- alcohol sales in Australia across variables that include beverage type, geographic region, outlet type, and on/off premises sales;
- the level of acute harms experienced at the local level including in and around licensed premises; and
- risk and protective factors for adolescent alcohol use and misuse through intersectoral longitudinal studies on children and/or adolescents.
- identifying the settings in which low and high risk alcohol consumption occurs;
- conducting regional field work to generate more accurate empirically-based estimates of the alcohol content of different alcoholic beverages and typical serve sizes; applying the resulting information to develop more precise estimates of drinking patterns and drinking levels from both sales and survey data; and using the findings to inform future data collection tools and methodologies;
- estimating the prevalence of low risk drinking, risky drinking and high risk drinking<sup>5</sup> levels in the general population in relation to both acute and chronic harm;
- assessing the impact of changes in knowledge of alcohol-related harms on patterns of alcohol consumption in the general population and in diverse groups including young people and Aboriginal and Torres Strait Islander peoples.

### Measurement tools

- Assess and improve the tools used to measure patterns of alcohol consumption and ensure that they are consistent with definitions of risk levels in the revised NHMRC Australian Alcohol Guidelines<sup>4</sup>.
- Reduce the discrepancy between estimates of total alcohol consumption based on sales data and estimates based on survey data, through commissioned research. The research should aim to identify best practice in achieving maximum coverage, through adequate sampling strategies, appropriate weightings of data, and conversion factors for alcohol content of reported drinks.
- Facilitate the adoption by police in all jurisdictions of recording blood alcohol levels in road injury, assaults (by offence type) and other incidents often related to alcohol use. The data involved should include demographic data, last place of drinking of offender, time of testing/drinking, time and place of incident.

### Socio-demographic trends

#### Patterns of consumption

- Develop more precise and rigorous definitions of patterns of alcohol consumption, and relationship of consumption patterns with social, cultural and economic factors, including:

#### Risk and protective factors

- Research the influence of risk and protective factors in the Australian setting on the early use and misuse of alcohol by adolescents, including research into the broader social determinants of health and implications of the work of Marmot and others on risk factors for early alcohol use.

#### Impact on family and relations

- Investigate the nature and magnitude of the effects of alcohol misuse on personal relationships, particularly in relation to domestic violence, divorce, and the impact on children. This could include investigation of predictive factors and preventive approaches.

#### Occupations

- Investigate the development of alcohol dependence and other alcohol-related harms in different occupational groups.

#### High risk groups

- Develop a longitudinal study on risk and protective factors and early alcohol use and misuse in Aboriginal and Torres Strait Islander children and adolescents. This could be an independent longitudinal study or developed in conjunction with an intersectoral child/adolescent longitudinal study.

<sup>4</sup>Australian Alcohol Guidelines: Health Risks and Benefits. Commonwealth of Australia, 2001

<sup>5</sup>As defined in the NHMRC Australian Alcohol Guidelines: Health Risks and Benefits. Commonwealth of Australia, 2001

- Undertake longitudinal monitoring of consumption patterns and indicators of harm among Indigenous Australians, in a way that is directly linked to provision of community-based intervention projects.
- Research the levels of alcohol risk, use and harms in correctional settings (including but not limited to incarceration).

#### **Acute and chronic harm**

- Conduct research into the prevalence and relative risk of alcohol as a causal factor, alone or in combination with other drugs, and with consideration of demographic and geographic variations, in relation to violence, suicide and attempted suicide, overdose, drowning, and road injury.
- Update the 1995 meta-analysis, carried out by English et al,<sup>6</sup> investigating the magnitude of the contribution of harmful and hazardous<sup>7</sup> alcohol consumption to the risk of chronic disease, as the underlying scientific evidence develops.
- Investigate the relationship between rates of alcohol consumption and the risk of dependence, and in particular, the nature of and risk factors for the progression from non-dependent drinking patterns to dependence.
- Investigate the impact of dietary factors on the long-term effects of alcohol and the potential to ameliorate these effects through diet modification.
- Investigate comorbidity involving alcohol, including the investigation of causal relations with particular attention to mental health problems, suicide, homelessness, and the role of alcohol in self-medication for depression, anxiety, and post-traumatic stress disorder.
- Investigate the role of alcohol in organ disease,

<sup>6</sup>English DR, Holman CD, Milne E, Winter MJ, Hulse GK, Codde G, Bower CI, Cortu B, de Klerk N, Lewin GF, Knuiman M, Kurinczuk JJ, Ryan GA (1995) The quantification of drug caused morbidity and mortality in Australia. Canberra: Commonwealth Department of Human Services and Health.

<sup>7</sup> "Harmful" and "hazardous", the terms used in the 1992 NHMRC guidelines, Is there a safe level of daily consumption of alcohol for men and women? and reported on by English et al, have been replaced in the 2001 Australian Alcohol Guidelines: Health Risks and Benefits by the terms "risky" and "high risk".

focussing on those areas that contribute most to morbidity and mortality.

- Investigate the impact of alcohol consumption patterns on cognitive function, and the role of alcohol in cognitive impairment.

#### **Socio-economic impact**

- Calculate the social and economic costs of chronic and acute alcohol-related harm.
- Investigate the nature, impact and causal interrelationship of excessive alcohol consumption on employment, including lost productivity and the ability to obtain and retain employment. This should include an estimation of hidden costs in the workforce relating to alcohol, including social costs, absenteeism, impact on others and ability to work on heavy machinery.

#### **Marketing and retailing environment**

- Investigate the impact of international linkages and changes in the ownership of alcohol manufacturers on sales and patterns of consumption.
- Carry out process and outcome evaluation of the alcohol industry's self-monitoring system of advertising and other forms of marketing and promotion.

## **Interventions**

### **Policy**

#### **Evaluation and monitoring**

- Further develop local, state and national indicators of high risk consumption and alcohol-related harm in order to facilitate rigorous evaluation of policy changes.
- Analyse the factors that determine priorities in policy making and implementation.
- Examine the nature of changes in the advertising, marketing and sales of alcohol, including the use of the internet; and in particular, examine the implications for educational strategies and messages aimed at preventing alcohol-related harm.

#### **Health systems and policy**

- Conduct health systems research in order to identify benchmarks for appropriate levels and types of service, taking into account links with

pathways of care, comparative costs and cost-effectiveness, and settings for treatment and interventions (eg prisons, hospitals).

### Regulatory policy

- Examine the impact of regulatory policy changes, both national and international, on drinking patterns, levels of consumption and levels of harm, with particular reference to specific sub-groups.
- Evaluate both the use and the effectiveness of legislation designed to minimise harms caused by alcohol in and around licensed premises.

### Community-based prevention

- Research ways to reduce the incidence and impact of fetal alcohol syndrome in Indigenous populations, and in other rural and remote populations, through the development of interventions in consultation with communities.
- Conduct research into the socio-cultural determinants of alcohol consumption by young people, and strategies to foster safer drinking practices in this group, including strategies for young people to regulate their own consumption.
- Conduct systematic evaluations of community-based interventions in Aboriginal and Torres Strait Islander communities.
- Conduct research on interventions in correctional settings, including but not limited to prisons.

### Geographic community study

- Conduct a geographically based study to evaluate an intervention/s that seeks to mobilise communities to reduce alcohol-related harm at the local level. The study would have two arms, urban and regional/rural, and would:
  - investigate, at the local level, issues around families, schools, mental health, suicide, and alcohol and other drugs;
  - have links with national strategies and programs in a range of relevant areas, including employment, family support, mental health, housing, and mass media;
  - use community development processes to focus on the interrelationships between the various elements within the local community, including partnerships between school and

community, policing and community, and workplace partnerships;

- assess the impact of industry promotion on the local community; and
- investigate issues around licensed premises and environs.

### School based interventions

- Evaluate school-based health promotion interventions aimed at reducing alcohol harm to determine best practice. Trial the best practice approaches in a range of urban and rural settings.

### Aboriginal and Torres Strait Islander communities

- Conduct longitudinal monitoring of consumption patterns and indicators of harm in the Indigenous community, in a way that is directly linked to and informs the provision of community-based intervention projects.
- Conduct systematic evaluations of community-based interventions in Aboriginal and Torres Strait Islander communities.
- Investigate whether restorative justice, which has the potential to have a public health impact through its impact on the wellbeing of individuals, families and communities, influences the levels of alcohol-related harm in Aboriginal and Torres Strait Islander communities.
- Conduct research into funding arrangements and training needs of Aboriginal and Torres Strait Islander community organisations.

### Workplace

- Conduct strategic, collaborative demonstration interventions that investigate how alcohol-related harm can best be prevented in a range of identified high risk workplaces.

### Licensed premises and law enforcement

- Develop a practical scale for the identification of high risk licensed premises, and examine strategies to modify activities such as sales to minors, sales to intoxicated patrons and overcrowding of high risk licensed premises.
- Identify, develop, trial and evaluate the intelligence and other systems that can assist in

sustaining the policing of licensed premises (by law enforcement or other means) in the longer term.

- Estimate the costs and cost benefits including effectiveness of different styles of policing licensed premises (by law enforcement or other means).
- Research the interrelationship between factors, both intrinsic and extrinsic to police services, that act as barriers to effective policing interventions in licensed premises.

### Individual, family and group

- Investigate interventions and treatment options for comorbidity involving alcohol, with particular attention to mental health problems, suicide, homelessness, and the role of alcohol in self-medication for depression, anxiety, and post-traumatic stress disorder.
- Identify and implement effective interventions in childhood to prevent or reduce the risk of alcohol-related harms, with a particular focus on family and parenting strategies. This could include:
  - the review of published evidence, including meta-analyses, looking for programs of demonstrated effectiveness in other areas (eg health, crime, education);
  - the development of assessment tools and risk and protective indicators;

- qualitative research to explore practitioner experience with unpublished intervention strategies; and
- trial of family interventions and parent education programs through the development of new models for vulnerable groups (eg Indigenous communities) and evaluation of alcohol outcomes for intervention strategies shown to be effective for other targets or outcomes.
- Examine the short-term and long-term efficacy and cost-effectiveness of approaches to the management of alcohol dependence, including self-help, psycho-social, and pharmacological methods, and their combination.
- Evaluate the efficacy and cost-effectiveness of brief interventions for at risk or problem drinkers, with particular attention to specific target groups, settings and delivery methods.

### Dissemination and utilisation

- Ensure research on Aboriginal and Torres Strait Islander peoples is made available to the clearing house established by OATSIH to ensure wide dissemination of the results.
- Evaluate the dissemination and sustained utilisation of evidence-based alcohol interventions and strategies to ensure their accessibility.

# Background papers for the March workshop

## Patterns of alcohol use in Australia

National Drug and Alcohol Research Centre, University of NSW

National Drug Research Institute, Curtin University of Technology

Commonwealth Department of Health and Ageing

## What do we know about alcohol consumption patterns in Australia?

Outlined below are the results of two recent analyses of national survey data on alcohol consumption patterns. These predominantly look at patterns in the narrow sense, in that they look at volume and frequency of alcohol consumption by individuals. This data however, does provide important indicators of harm by measuring the proportions of the overall population (and sub-populations) who exceed safe consumption levels.

### National Drug Strategy Household Survey (1998)

The 1998 National Drug Strategy Household Survey (NDSHS) was conducted by the Australian Institute of Health and Welfare for the Commonwealth Department of Health and Aged Care. Households were selected using a multistage, stratified area random-quota sample design. The survey used a split sample design: one sample involved persons 14 years and over, from randomly selected households around the nation, who had the next birthday ( $n = 4,012$ ); the second sample included the youngest person 14 years and over in the above randomly selected households ( $n = 1,983$ ); and the third sample was obtained from capital cities, and included 4,035 persons aged between 14-39 years who had the next birth date. The survey had a response rate of 56%, and totalled 10,030 persons.

Recent work by Heale and colleagues (2000) involved analysis of data from the 1998 NDSHS to examine alcohol consumption patterns according to levels of risk defined by the National Health and Medical Research Council (National Health and Medical Research Council, 2000) and consistent with the definitions of risk provided by WHO (2000). Table 1 shows the proportion of persons who were abstainers, and drinking at low, medium and high risk levels, by age and sex.

**Table 1: Proportion of adults in the general population who are lifetime abstainers, current abstainers and low, medium and high risk drinkers by age and sex**

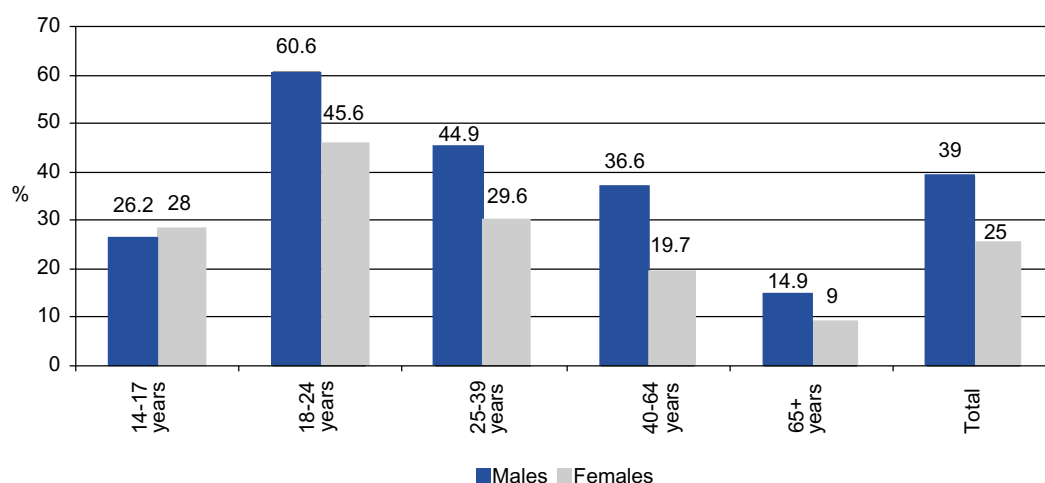
|                     | %     |       |       |       |      |       |
|---------------------|-------|-------|-------|-------|------|-------|
|                     | 14-17 | 18-24 | 25-39 | 40-64 | 65+  | Total |
| <b>FEMALES</b>      |       |       |       |       |      |       |
| Lifetime abstainers | 32.3  | 6.9   | 6.0   | 9.4   | 27.9 | 12.3  |
| Current abstainers  | 5.6   | 6.3   | 10.4  | 13.8  | 17.3 | 11.7  |
| Low risk            | 61.1  | 78.2  | 77.1  | 68.8  | 50.2 | 69.4  |
| Medium risk         | 0.8   | 4.5   | 5.4   | 6.0   | 4.6  | 5.1   |
| High risk           | 0.2   | 4.2   | 1.1   | 2.0   | 0.0  | 1.6   |
| <b>MALES</b>        |       |       |       |       |      |       |
| Lifetime abstainers | 29.6  | 5.9   | 4.0   | 5.4   | 7.6  | 7.0   |
| Current abstainers  | 8.7   | 6.1   | 7.5   | 9.2   | 13.9 | 8.8   |
| Low risk            | 59.1  | 76.1  | 82.2  | 76.9  | 73.5 | 76.8  |
| Medium risk         | 2.4   | 4.3   | 3.1   | 6.0   | 1.9  | 4.1   |
| High risk           | 0.3   | 7.6   | 3.3   | 2.5   | 3.1  | 3.3   |
| <b>TOTAL</b>        |       |       |       |       |      |       |
| Lifetime abstainers | 31.0  | 6.4   | 5.0   | 7.4   | 18.3 | 9.6   |
| Current abstainers  | 7.0   | 6.1   | 8.9   | 11.5  | 15.7 | 10.3  |
| Low risk            | 60.1  | 77.1  | 79.7  | 72.9  | 61.2 | 73.1  |
| Medium risk         | 1.6   | 4.4   | 4.2   | 6.0   | 3.3  | 4.6   |
| High risk           | 0.3   | 6.0   | 2.2   | 2.2   | 1.5  | 2.5   |

Source: Heale et al (2000)

It was estimated that Australians aged 14 and over drank an average of 358 standard drinks (=10g) per year or 4.47 litres of pure alcohol per person per year. This is only 47% of recorded alcohol sales in Australia in 1997/8 and hence the NDSH survey substantially under-estimates alcohol consumption.

Persons at risk of acute harm were taken to be those who consumed at high risk levels (ie in excess of 6 drinks on a single occasion for males and 4 drinks for females) at least once a month in the past year. Almost half (46%) of males and one third (33%) of females reported drinking at risky levels for short-term health problems (e.g. accidents and injuries) at least one day a month. These proportions were highest among 18-24 year olds.

**Figure 1: Percentage of all respondents consuming alcohol at high risk levels for acute harm at least once a month (including abstainers) in total sample, by sex and age group (weighted data)**



A much smaller proportion of males (9%) and of women (9%) reported drinking at risk levels for chronic harm. Young males aged 18-24 were most likely to be drinking at high risk levels (14%), followed by females aged 18-24 years (29%).

**Table 2: Proportion of current drinkers consuming at low, medium and high risk levels for chronic harm by age and sex.**

|                | 14-17 | 18-24 | 25-39 | 40-64 | 65+  | TOTAL |
|----------------|-------|-------|-------|-------|------|-------|
| <b>Males</b>   |       |       |       |       |      |       |
| Low risk       | 95.7  | 86.4  | 92.8  | 90.1  | 93.6 | 91.1  |
| Medium risk    | 3.8   | 4.9   | 3.5   | 7.0   | 2.4  | 4.9   |
| High risk      | 0.5   | 8.7   | 3.7   | 2.9   | 4.0  | 4.0   |
| <b>Females</b> |       |       |       |       |      |       |
| Low risk       | 98.4  | 90.0  | 92.2  | 89.6  | 91.7 | 91.2  |
| Medium risk    | 1.3   | 5.2   | 6.5   | 7.8   | 8.3  | 6.7   |
| High risk      | 0.3   | 4.9   | 1.3   | 2.6   | 0.0  | 2.1   |
| <b>Total</b>   |       |       |       |       |      |       |
| Low risk       | 97.1  | 88.1  | 92.5  | 89.9  | 92.8 | 91.2  |
| Medium risk    | 2.5   | 5.0   | 4.9   | 7.4   | 5.0  | 5.7   |
| High risk      | 0.4   | 6.8   | 2.5   | 2.8   | 2.2  | 3.1   |

Source: Heale et al (2000)

Further analysis of these data showed that 51% of all the alcohol reportedly consumed in the NDSH survey was consumed on occasions when low risk levels for acute harm were exceeded. Furthermore, 39% of all the alcohol reported in the survey was consumed by people who were consistently drinking above recommended low risk levels for long-term health problems (Heale et al, 2000).

### National Survey of Mental Health and Well-Being (1997) (NSMHWB)

The NSMHWB sample was a representative sample of residents in private dwellings across all States and Territories in Australia, conducted by the Australian Bureau of Statistics (ABS) in 1997. The sample excluded special dwellings (hospitals, nursing homes, hostels etc.), and dwellings in remote and sparsely populated areas of Australia. Dwellings were selected using random stratified multistage area sampling, so that each person in all States and Territories had a known chance of participation. One person aged at least 18 years was randomly selected from each dwelling and asked to participate. Approximately 13,600 private dwellings were approached, with a final sample size of 10,641 persons giving a response rate of 78%. Respondents were asked if they had consumed at least 12 standard drinks (10g alcohol) within the past 12 months. All those who reported such use, and who had consumed more than 3 standard drinks on one occasion, were assessed for alcohol use disorders.

The NSMHWB was intended to measure population patterns of the most common mental disorders in the Australian general population (among which alcohol abuse and dependence rate among the most common). Hence, the approach taken in measuring alcohol consumption differed from that of the NDSHS, which was intended to measure population patterns of substance use.

When asked about the typical number of drinks consumed on a drinking day, the majority of males and females reported 1 to 3 drinks was the average (67% and 82% respectively; Table 7) (Degenhardt, Hall, Teesson, & Lynskey, 2000). One quarter of males reported drinking 4 to 8 drinks on a typical drinking day, compared to only 15% of females (Table 7). Around one quarter of persons reported drinking each of the following: every day (27%), 1 to 3 days per month (24%), and 1 to 2 days per week (24%). Around 3 in 10 males reported drinking every day, compared to 2 in 10 females (Table 7). Most drinkers had begun drinking at their typical frequency and quantity more than one year ago (94.5%; SE = 0.4), and three quarters had done so within the past two weeks (73%).

Males were more likely than females to report drinking greater quantities of alcohol on their heaviest drinking session ( $\chi^2(24df)= 1339.2, p<.00001$ ). Approximately 2 in 5 males reported drinking between 9 to 12 drinks (22%) or between 13-20 drinks (21%), with a further 9% reporting more than 20 drinks in their heaviest drinking session. In comparison, half of females (49%) reported that in their most heavy session, they consumed 1 to 3 drinks, with a further one third reporting 4 to 8 drinks (35%).

**Table 3: Patterns of alcohol use among drinkers according to gender**

|  | <b>Females<br/>% (SE)</b> | <b>Males<br/>% (SE)</b> | <b>Persons<br/>% (SE)</b> |
|--|---------------------------|-------------------------|---------------------------|
| <b>Typical number of drinks per day</b>                  |                           |                         |                           |
| 1-3 drinks   | 82.1 (0.7)                | 66.3 (1.3)              | 73.3 (0.8)                |
| 4-8 drinks   | 15.0 (0.6)                | 24.9 (0.8)              | 20.5 (0.6)                |
| 9-12 drinks  | 2.2 (0.3)                 | 6.2 (1.0)               | 4.4 (0.5)                 |
| 13-20 drinks   | 0.5 (0.1)                 | 1.6 (0.3)               | 1.1 (0.2)                 |
| 21 or more   | 0.3 (0.1)                 | 0.8 (0.2)               | 0.6 (0.1)                 |
| <b>Typical frequency of alcohol use</b>                  |                           |                         |                           |
| Less than once a month                                   | 10.8 (0.9)                | 6.0 (0.6)               | 8.1 (0.5)                 |
| 1-3 days per month                                       | 29.3 (0.9)                | 20.5 (0.8)              | 24.3 (0.6)                |
| 1-2 days per month                                       | 24.4 (0.8)                | 24.3 (0.7)              | 24.3 (0.5)                |
| 3-4 days per week  | 14.4 (0.6)                | 18.2 (1.3)              | 16.5 (0.7)                |
| every day  | 21.1 (1.2)                | 31.1 (1.0)              | 26.8 (0.5)                |
| <b>Most drinks on a single day</b>                       |                           |                         |                           |
| 1-3 drinks   | 48.5 (1.3)                | 25.4 (1.0)              | 35.6 (0.8)                |
| 4-8 drinks   | 35.4 (1.2)                | 31.6 (1.2)              | 33.3 (0.6)                |
| 9-12 drinks  | 10.9 (0.5)                | 21.5 (0.9)              | 16.8 (0.6)                |
| 13-20 drinks   | 3.2 (0.3)                 | 12.3 (0.8)              | 8.3 (0.5)                 |
| 21 or more   | 2.0 (0.2)                 | 9.2 (0.4)               | 6.0 (0.2)                 |
| <b>Recency of typical frequency &amp; no. of drinks*</b> |                           |                         |                           |
| Within past 2 weeks                                      | 69.7 (1.4)                | 74.8 (1.5)              | 72.5 (1.3)                |
| 2 weeks - 1 month ago                                    | 13.0 (1.1)                | 12.3 (1.8)              | 12.6 (1.4)                |
| 1 month - 6 months ago                                   | 13.2 (0.8)                | 10.0 (0.5)              | 11.4 (0.5)                |
| 6 months - 1 year ago                                    | 2.9 (0.3)                 | 1.9 (0.3)               | 2.4 (0.2)                 |
| in last 12 months  | 0.7 (0.2)                 | 0.3 (0.1)               | 0.5 (0.1)                 |

\* Some missing data: n = 50 persons reported recency of typical frequency and amount of use as more than 1 year ago

As might be expected, drinking patterns differed markedly according to involvement with alcohol use. Almost all drinkers who did not meet criteria for a DSM-IV use disorder reported that their typical number of drinks was 1 to 3 (77%) or 4 to 8 (18%) on a drinking day. Those who met criteria for alcohol abuse were those most likely to report heavier consumption on a drinking day, with 1 in 5 reporting 9 to 12 drinks was their standard amount, and half reporting 4 to 8 drinks was typical for them. Those who met criteria for dependence were most likely to report drinking between 4 to 8 drinks (39%) or 1 to 3 drinks (36%) on a typical drinking day.

While those meeting criteria for alcohol abuse reported greater average alcohol consumption than those who were alcohol dependent, the latter reported more frequent use of alcohol. Almost half of dependent persons (48%) reported daily alcohol use, compared to one third of those meeting criteria for abuse (33%). Similar proportions of both groups reported use between 1 to 4 days per week (49% for abuse, 44% for dependence). For most persons (around 93%) typical use patterns had begun more than one year ago, and this was independent of their level of involvement with alcohol.

Those meeting criteria for alcohol abuse or dependence were much more likely to report drinking larger amounts of alcohol on their heaviest drinking session than drinkers who did not meet criteria for a use disorder.

For further discussion of interventions for alcohol dependence and abuse see the Teesson and Proudfoot paper in this volume.

**Table 4: Patterns of alcohol use according to alcohol involvement**

|  | Use without disorder<br>% (SE) | Abuse<br>% (SE) | Dependence<br>% (SE) |
|--|--------------------------------|-----------------|----------------------|
| <b>Typical no. of drinks per day</b>                     |                                |                 |                      |
| 1-3 drinks   | 77.0 (0.8)                     | 22.5 (3.2)      | 35.7 (3.3)           |
| 4-8 drinks   | 18.5 (0.6)                     | 50.3 (3.9)      | 39.5 (3.8)           |
| 9-12 drinks  | 3.4 (0.5)                      | 21.1 (3.6)      | 14.4 (2.7)           |
| 13-20 drinks   | 0.8 (0.1)                      | 4.7 (1.8)       | 4.9 (1.1)            |
| 21 or more   | 0.2 (0.08)                     | 1.5 (1.5)       | 5.5 (1.7)            |
| <b>Typical frequency of use</b>                          |                                |                 |                      |
| Less than once a month                                   | 8.7 (0.6)                      | 2.3 (1.3)       | 0.9 (0.5)            |
| 1-3 days per month                                       | 25.6 (0.7)                     | 16.1 (4.2)      | 7.3 (5.1)            |
| 1-2 days per month                                       | 24.4 (0.6)                     | 30.0 (4.9)      | 20.2 (2.7)           |
| 3-4 days per week  | 16.0 (0.6)                     | 19.1 (3.7)      | 24.1 (3.9)           |
| every day  | 25.3 (0.5)                     | 32.5 (4.7)      | 47.5 (2.5)           |
| <b>Most drinks on a single day</b>                       |                                |                 |                      |
| 1-3 drinks   | 38.8 (0.9)                     | -               | -                    |
| 4-8 drinks   | 34.8 (0.7)                     | 14.0 (3.2)      | 16.3 (3.8)           |
| 9-12 drinks  | 15.5 (0.6)                     | 35.6 (5.0)      | 29.8 (5.3)           |
| 13-20 drinks   | 6.7 (0.4)                      | 26.2 (5.2)      | 25.7 (2.9)           |
| 21 or more   | 4.1 (0.3)                      | 24.2 (3.3)      | 28.2 (2.1)           |
| <b>Recency of typical frequency &amp; no. of drinks*</b> |                                |                 |                      |
| Within past 2 weeks                                      | 72.2 (1.0)                     | 73.8 (4.4)      | 78.1 (6.6)           |
| 2 weeks - 1 month ago                                    | 12.7 (1.0)                     | 14.0 (4.3)      | 9.2 (7.3)            |
| 1 month - 6 months ago                                   | 11.6 (0.5)                     | 10.2 (2.6)      | 9.1 (2.4)            |
| 6 months - 1 year ago                                    | 2.4 (0.2)                      | 1.4 (0.8)       | 2.4 (0.8)            |
| in last 12 months  | 0.5 (0.1)                      | -               | 0.6 (0.4)            |

\* Some missing data - n = 50 persons reported recency of typical use as more than 12 months ago

## Alcohol consumption patterns among different subpopulations

Alcohol use patterns differ among different groups in the population. A thorough review of the patterns of alcohol consumption in different groups is beyond the scope of the present paper, but the following is a number of key groups among whom alcohol use patterns are noticeably different.

Males consume more alcohol more frequently and at higher levels than females, and they typically begin drinking at a younger age (Australian Institute of Health and Welfare, 1999), although this gender difference seems to be less marked among teenagers (14-19 year olds) in the most recent NDSHS (Australian Institute of Health and Welfare, 1999).

Alcohol use is also heavier and more frequent among younger adults, as are alcohol use disorders (abuse and dependence) (Australian Institute of Health and Welfare, 1999; Hall, Teesson, Lynskey, & Degenhardt, 1999). In particular, binge drinking (more than 12 standard drinks in a session for males, and more than 8 for females) is highly prevalent among young people in Australia (Australian Institute of Health and Welfare, 1999). Research undertaken for the National Alcohol Campaign found that teenagers regularly drink at hazardous and harmful levels. In 1998, 28% of 15-17 year olds drank 7 or more standard drinks on their most recent drinking occasion, while 36% had more than 5 and 52% had more than 3 standard drinks (Elliot & Shanahan Research, 1999). Male teenagers in particular are likely to consume at harmful levels, with 23% consuming 10 or more standard drinks on their last occasion compared to 14% of females.

Given that the Australian population is ageing, it must be recognised that alcohol use is problematic for older adults at lower levels of consumption, and that diagnostic criteria may not “capture” problematic alcohol use among this population (Hall & Degenhardt, 1998). Older adults are also more likely to regularly take medication, which may have interactions with alcohol (Single et al, 1999). Alcohol consumption among older adults is currently low, with 70% of people over 60 years consuming no more than 2 standard drinks on a day (Adhikari & Summerill, 2000). However, there is evidence to suggest that individual drinking patterns remain fairly stable over time, so that, for example, as people born in the decades after World War II move into older age groups, their consumption patterns may be more harmful than those currently in older age groups (NIAAA, 1998).

Patterns of alcohol use among Indigenous Australian people differ from those of non-Indigenous populations (Australian Institute of Health and Welfare, 1995). While there is a lower prevalence of any use of alcohol, research by the AIHW found that 68% of Indigenous drinkers drank at harmful levels, compared to 11% of drinkers in the general population (Australian Institute of Health and Welfare, 1995). In addition, the effects of harmful drinking in Indigenous populations are exacerbated by other factors such as high smoking rates, poor nutrition and obesity (Single et al, 1999).

Analysis of data from the 1998 National Drug Strategy Household Survey (Williams, 1999), shows that alcohol consumption also varies by geographic area, particularly for young people. Young people aged 14-19 in rural and remote areas are more likely to have consumed alcohol (82% have recently consumed) than those in metropolitan areas (71.5%). The picture is similar for 20-24 year olds. Rural and remote youth are also more likely to consume at hazardous and harmful levels, with 68.6% (cf. 65.7%) of 14-19 year olds and 61.4% (cf. 54.5%) of 20-24 year olds consuming at these levels.

There are a number of other correlates of alcohol misuse in the Australian adult population (Hall et al., 1999). Those who are separated or divorced, or who have never been married, are more likely to meet criteria for an alcohol use disorder (abuse or dependence) (Degenhardt et al., 2000). Furthermore, unemployed people are more likely to meet criteria for alcohol abuse or dependence (Degenhardt et al., 2000).

The Women’s Health Australia study also identified a range of socio-demographic factors and health behaviours and conditions associated with various drinking patterns (Jonas et al., 2000). Young women (18-23 years) who did not drink were more likely to be married, non-smokers, born in non-English speaking countries and have lower levels of education and employment. Women who had a ‘low intake’ (< 14 drinks a week) as well as those who drank at hazardous or harmful levels were more likely to be unmarried, smokers, live in rural and remote areas, have had an STD and used unhealthy diets (Jonas et al., 2000). As might be expected given the results of the research for the National Alcohol Campaign,

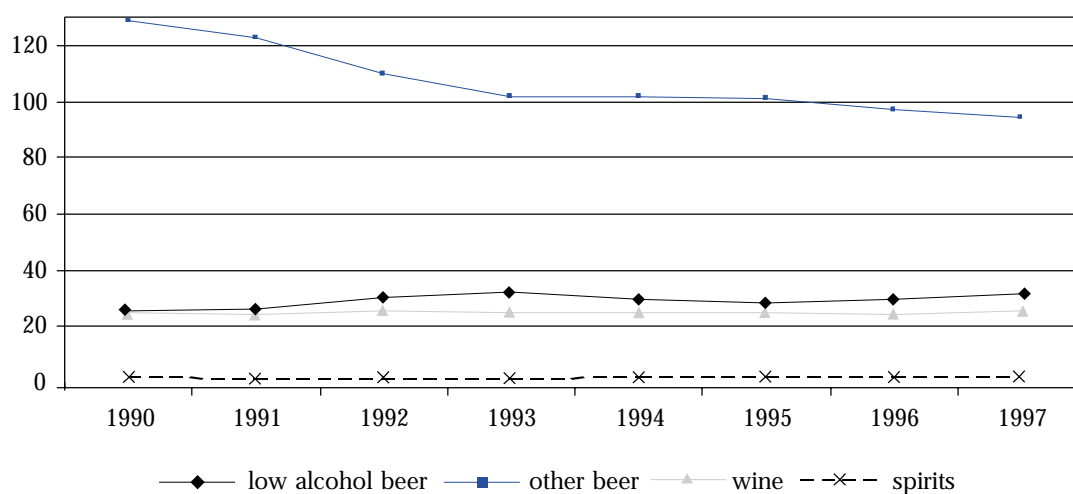
a majority of drinkers, including those with an average 'low intake', reported binge drinking

### Changes in drinking patterns in Australia over the past decade

In Australia, the lifetime prevalence of alcohol use has been relatively stable over the past decade (1985-1998), with more than 90% of persons reporting the use of alcohol at some point in their lives (Australian Institute of Health and Welfare, 1999; Makkai & McAllister, 1998). Similarly, there has been little change over the past decade in rates of alcohol use within the past year, with around 80% of adults reporting alcohol use in the past year (Australian Institute of Health and Welfare, 1999; Makkai & McAllister, 1998).

There has, however, been a change in the type of beverage consumed. The per capita consumption of full strength beer has declined and the consumption of low alcohol beer has increased (Figure 2).

**Figure 2: Apparent per capita consumption of alcohol, 1990 to 1997**



Source: Higgins et al., (2000)

## How do we assess alcohol consumption?

### Estimating per capita alcohol consumption from sales data

Adult per capita consumption data are useful as an indicator of the severity and trends in alcohol-related problems, in conjunction with more specific data on alcohol problems. For example, a recent and comprehensive study of links between per capita consumption and fatal injuries in 14 EU countries found significant and substantial relationships (Skog, in press). Recent reports from the National Alcohol Indicators Project have found that national levels of alcohol-caused mortality and alcohol-related road trauma closely follow trends in per capita alcohol consumption (Chikritzhs et al., 1999; Chikritzhs et al., 2000a).

When interpreting alcohol sales data, there are some factors that are not likely to be reflected in the data include smuggling, tourism, overseas consumption, stockpiling, duty-free purchases and the exclusion of home- or informally-produced and traded alcohol. Available data from the NT (Chikritzhs, Stockwell, Heale, Dietze, & Webb, 2000b) suggest that these are not likely to be significant issues for Australia. Questions can be added to periodic representative national drinking surveys to provide the bases for estimates of the duty-free purchasing, overseas consumption and consumption of home or informally-produced alcoholic beverages (World Health Organization, 2000).

A useful additional indicator is per capita consumption of beverages more frequently associated with harmful outcomes, such as beer with an alcohol content of at least 3.5%. Other than this, it should be realised that per capita consumption data cannot be used on their own to estimate the extent to which

alcohol is being consumed in a pattern that presents risks to individual drinkers and those with whom they come in contact. However, while it is theoretically possible for per capita consumption to change without there being concomitant changes in the prevalence of risky drinking, in practice in all societies studied there has been a close relationship between per capita consumption and high risk alcohol use (Edwards et al., 1994). In the Australian context Stockwell and colleagues (1996) have demonstrated very high correlation across different geographic regions in total alcohol sales and numbers of drinkers identified by survey as drinking at risky levels.

At the present time it is only possible to report per capita alcohol consumption for Western Australia, Queensland and the Northern Territory on the basis of annual returns from wholesalers to liquor licensing authorities. They can also be estimated from data available in the ACT. A 1997 High Court decision prevented states and territories from collecting taxes on wholesale alcohol sales and the other jurisdictions have elected to cease collecting these despite the potential for their assisting in the regional monitoring of harm minimisation efforts. Per capita consumption data are reported annually by the Australian Bureau of Statistics for the whole of Australia with no regional breakdowns.

## Estimating alcohol consumption from national surveys

### **Advantages and limitations of survey compared with sales data**

Population surveys of alcohol consumption are the main means of providing information on the pattern as opposed to the overall level of drinking. Surveys cannot determine per capita alcohol consumption and are also too costly to be a reliable means of regularly assessing local trends in alcohol use. Despite these major limitations, surveys are the major means of estimating the prevalence of risky drinking among different socio-demographic groups.

A major advantage of surveys is that they enable consumption patterns to be linked with consequences at the individual level. Importantly, they may elucidate factors that modify these associations, for example, characteristics of the drinker or the drinking context.

Although survey estimates of alcohol consumption tend to substantially underreport volume of consumption relative to sales data (Heale, Stockwell, Dietze, Chikritzhs, & Catalano, 2000), they can be used to estimate the proportion of consumption that is otherwise not recorded by sales data. This includes alcohol obtained illegally or outside of the country. In countries where unrecorded consumption comprises a significant proportion of overall alcohol intake, changes in the prevalence of alcohol-related harm cannot be properly interpreted without monitoring this aspect of alcohol consumption. The 1998 National Drug Strategy Household Survey only accounted for 46.5% of the alcohol known to be sold in Australia that year when average consumption for men and women was extrapolated to the nation as a whole (Heale et al., 2000). However, it is unlikely that cross-border sales or home production accounts for much of this discrepancy.

The advantages of sales data include the fact that sales data are geographically and temporarily specific, they are cheap or free, and they are available annually in four jurisdictions. Data are also provided on the details of drinking locations (from alcohol license types) and on the types of beverages sold, such as low vs high alcohol beer. The Northern Territory has quarterly data on bottled and cask wine, and on pre-mixed and neat spirits. Sales data are also comprehensive and the basis for estimates of per capita consumption.

### **Measures of high risk drinking for acute problems**

The most commonly used measures of High Risk drinking for acute problems are: 1) the proportion of drinkers or of the total population drinking at a level deemed to be High Risk (e.g. at or above some threshold number of drinks/grams of ethanol per day) at a specified frequency during a given period. For example, this may be the proportion of drinkers who ever drank 5+ drinks on any one day in the past month; and 2) the volume of consumption that is consumed on 'High Risk' drinking days. From the volume of High Risk consumption, the proportion of total intake that exceeds the High Risk threshold or is consumed on High Risk drinking occasions may also be estimated.

The thresholds used as indicators of High Risk drinking typically have a scientific basis (e.g., the

number of drinks that would correspond to a blood alcohol level at which psychomotor impairment has been documented). They may also reflect drinking guidelines. Indeed, one purpose for measuring High Risk consumption is to monitor the success of prevention programs.

The most commonly used cut-off for High Risk drinking in the research literature is ‘5 plus drinks’ in a day (this is North American), i.e. between 60+g and 68+g of alcohol depending on whether a standard drink is defined as 12g (usual for USA - though it is sometimes defined as 14g) or 13.6g (Canada). In Australia and New Zealand, more than 60g of alcohol or 6 standard drinks in a day tends to be used for men and 40g for women. In the UK, some studies have used 8 ‘units’ or 64g in a day for men. These apparent disparities in drink numbers still permit the recommendation for an international cut-off for High Risk drinking as greater than 60g of ethanol on any given drinking day for men. Given evidence that women tend to experience greater intoxication from a given amount of alcohol, it is also recommended that the lower cut-off of greater than 40g of ethanol is used for women.

A number of important caveats must be born in mind in relation to these recommendations. First, while they are based on some evidence from developed countries (e.g. (McLeod, Stockwell, Stevens, & Phillips, 1999), they do not imply invariable risk levels across all individuals and all drinking settings but rather average risk for a population. Second, “Low Risk” categories do not denote drinking that is risk-free. Third, these risk levels must be clearly distinguished from those that apply to typical daily drinking i.e. average intake of alcohol across all days, which will usually be a lower figure. Notably, the NHMRC draft drinking guidelines have also adopted definitions consistent with the first three of these levels.

**Table 5: Criteria for risk of consumption on a single drinking day - for comparative research purposes only**

|                | Males      | Females   |
|----------------|------------|-----------|
| Low Risk       | 1 to 40g   | 1 to 20g  |
| Medium Risk    | 41 to 60g  | 21 to 40g |
| High Risk      | 61 to 100g | 41 to 60g |
| Very High Risk | 101+g      | 61+g      |

### Measures of high risk drinking for chronic harm

English et al (1995) and Single et al (1999) have classified average ethanol intake per drinking day as Low Risk, “hazardous” or “harmful” according to specific cut-offs for men and for women. NHMRC refer to these same cut-offs as “Low Risk”, “Risky” and “High Risk” for long-term alcohol-related harm. The change in terminology was adopted to avoid the implication that harm will invariably arise from such drinking when in fact it is only probable (National Health and Medical Research Council, 2000).

**Table 6: Low, Medium and High Risk average daily consumption levels for men and women long-term risk of serious illness (WHO. 2000)\***

|        | LEVEL OF RISK |        |      |
|--------|---------------|--------|------|
|        | LOW           | MEDIUM | HIGH |
| Male   | 1-40g         | 41-60g | 61+g |
| Female | 1-20g         | 21-40g | 41+g |

\* NB. For comparative research purposes only.

### Measures of drinking context

Typically, measures of drinking context focus on where and with whom drinking takes place. When a Last 7 Days approach is used to measure alcohol consumption for a limited reference period, these factors can be specified for each drink consumed. When assessing generalized drinking patterns, there are three general approaches to measuring drinking context: asking respondents where they usually

drink, how often they drink in certain identified settings (eg home, bar, public place, private party etc) and the amount of time spent drinking in such contexts (WHO, 2000).

## What do we need to know about alcohol consumption?

Alcohol consumption patterns, in both the narrow and broad senses, are important indicators of alcohol-related harm, and information on patterns at both the individual and population levels is crucial in targeting and evaluating prevention and treatment initiatives. Populations and drinking settings that have higher than average risks of harm are now largely identified, and current national survey data provides an overview of consumption patterns.

Additionally, a recommended methodology for monitoring alcohol consumption is available in the form of the recent World Health Organization publication (WHO, 2000).

Based on the material considered for this paper, the following research recommendations have been made.

## Recommendations for future research

### Improved measurement of drinking patterns

It is necessary to have data from national surveys that provide estimates of the prevalence of low, medium and high risk drinking levels in the general population in relation to both acute and chronic harm. The National Drug Strategy Household Survey and major state-based surveys of alcohol use should employ drinking categories consistent with the new draft NHMRC National Drinking Guidelines (National Health and Medical Research Council, 2000).

In addition to data on drinking patterns in the general population, it is particularly important to have data on population groups that have been identified as being at increased risk of alcohol-related harm. The National Drug Strategy Household Survey Indigenous Supplement should be undertaken again to provide more recent data, and repeated at regular intervals.

### Improved measurement of volume of drinking

For several important reasons, efforts should be made to reduce the current large discrepancy between estimates of total alcohol consumption based on sales data as opposed to survey data. Research should be commissioned to identify best practice to achieve maximum coverage by means of adequate sampling strategies, appropriate weightings of data and conversion factors for alcohol content of reported 'drinks'. Achieving a better estimate of amounts of alcohol consumed by survey will enable more accurate estimates of the prevalence of high risk drinking which, in turn, will permit the calculation of more accurate aetiologic fractions for causes of death partially attributable to alcohol.

### Improved measurement of drinking context

In addition to improved quantification of alcohol intake, future research should concentrate on identifying the settings in which low and high risk alcohol consumption tends to occur. Drinking in some settings is inherently low or high risk - e.g. drinking in association with a meal as opposed to before driving, swimming or skiing. Speed of drinking is another important pattern variable that has been relatively neglected by drinking surveys but clearly has major consequences for risk of acute harm.

## References

- Adhikari, P., & Summerill, A., (2000). 1998 *National Drug Strategy Household Survey: Detailed findings*. AIHW cat. no. PHE 27. Canberra :AIHW (Drug Statistic Series No. 6).
- Australian Institute of Health and Welfare. (1995). *National Drug Strategy Household Survey: Urban Aboriginal and Torres Strait Islanders Supplement 1994* . Canberra: Australian Government Publishing Service.
- Australian Institute of Health and Welfare. (1999). *1998 National Drug Strategy Household Survey: First results*. Canberra: AIHW (Drug Statistics Series).
- Chikritzhs, T., Jonas, H., Heale, P., Dietze, P., Hanlin, K., & Stockwell, T. (1999). *Alcohol-caused deaths and hospitalisations in Australia* . Perth, WA: National Drug Research Institute, Curtin University of Technology.
- Chikritzhs, T., Stockwell, T., Heale, P., Dietze, P., & Webb, M. (2000a). *Trends in alcohol-related road injury in Australia, 1990-1997*. Perth, WA: National Drug Research Institute, Curtin University of Technology.
- Chikritzhs, T., Stockwell, T., Hendrie, D., Ying, F., Fordham, R., Cronin, J., Orlemann, K., & Phillips, M. (2000b). *The public health, safety and economic benefits of the Northern Territory's Living With Alcohol program 1992/3 to 1995/6* . Perth, WA: National Drug Research Institute, Curtin University of Technology.
- Degenhardt, L., Hall, W., Teesson, M., & Lynskey, M. (2000). *Alcohol use disorders in Australia: Findings from the National Survey of Mental Health and Well-Being* (Technical Report 97). Sydney: National Drug and Alcohol Research Centre, UNSW.
- Edwards, G., Anderson, P., Babor, T., Casswell, S., Ferrence, R., Giesbrecht, N., Godfrey, C., Holder, H., Lemmens, P., Makela, K., Midanik, L., Norstrom, T., Osterberg, E., Romelsjo, A., Room, R., Simpura, J., & Skog, O. (1994). *Alcohol policy and the public good*. Oxford: Oxford University Press.
- Elliot & Shanahan Research. (1999). *Developmental Research for a National Alcohol Campaign: Summary Report* Canberra: Commonwealth Department of Health and Aged Care.
- English, D., Holman, C., Milne, E., Winter, M., Hulse, G., Codde, S., Corti, B., Dawes, V., De Klerk, N., Knuiman, M., Kurinczuk, J., Lewin, G., & Ryan, G. (1995). *The quantification of drug caused morbidity and mortality in Australia, 1995* . Canberra: Commonwealth Department of Human Services and Health.
- Grant, M., & Litvak, J. (1998). *Drinking patterns and their consequences*. Washington, DC: Taylor and Francis.
- Hall, W., & Degenhardt, L. (1998). The decline in alcohol disorders with age: Causes and implications. *Australian Journal On Ageing*, 17(4), 158-159.
- Hall, W., Teesson, M., Lynskey, M., & Degenhardt, L. (1999). The 12-month prevalence of substance use and ICD-10 substance use disorders in Australian adults: Findings from the National Survey of Mental Health and Well-Being *Addiction*, 94(10), 1541-1550.
- Heale, P., Stockwell, T., Dietze, P., Chikritzhs, T., & Catalano, P. (2000). *Patterns of alcohol consumption in Australia* . Perth: National Drug Research Institute, Curtin University.
- Higgins, K., Cooper-Stanbury, M., & Williams, P. (2000). *Statistics on drug use in Australia* . Canberra: Australian Institute of Health and Welfare (Drug Statistics Series).
- Jonas, H., Dobson, A., & Brown, W. (2000). Patterns of alcohol consumption in young Australian women: socio-demographic factors, health-related behaviours and physical health. *Australian and New Zealand Journal of Public Health*, 24(2), 185-191.
- Makkai, T., & McAllister, I. (1998). *Patterns of drug use in Australia, 1985-1995*. Canberra: Australian Government Publishing Service.
- Mathers, C., Vos, T., & Stevenson, C. (1999). *The Burden of Disease and Injury in Australia*. Canberra: Australian Institute of Health and Welfare.

- McLeod, R., Stockwell, T., Stevens, M., & Phillips, M. (1999). The relationship between alcohol consumption patterns and injury. *Addiction*, 94(11), 1719-1734.
- Murray, C., & Lopez, A. (1996). *The global burden of disease*. Cambridge, MA: Harvard University Press.
- National Health and Medical Research Council. (2000). *National drinking guidelines: draft for public consultation*. Canberra: NHMRC.
- National Institute on Alcohol Abuse and Alcoholism. (1998). Alcohol and Aging. *Alcohol Alert*. No. 40. Bethesda, MD: NIAAA.
- Rehm, J., Ashley, M. J., Room, R., Single, E., Bondy, S., Ferrence, R., & Giesbrecht, N. (1996). On the emerging paradigm of drinking patterns and their social and health consequences. *Addiction*, 91, 1615-1621.
- Ridolfo, B. & Stevenson, C. (2001). *The quantification of drug-caused mortality and morbidity in Australia, 1998*. AIHW cat. no. PHE 29. Canberra: AIHW (Drug Statistics Series no. 7).
- Roche, A. (1998). The shifting sands of alcohol research and prevention. *Australian & New Zealand Journal of Public Health*, 21, 621-625.
- Single, E., Ashley, M., Bondy, S., Rankin, J., & Rehm, J. (1999). *Evidence regarding the level of alcohol consumption considered to be low-risk for men and women*. Canberra: Commonwealth Department of Health and Aged Care.
- Skog, O.-J. (in press). Alcohol consumption and overall accident mortality in 14 European countries. *Addiction*.
- Stockwell, T. (2000). Research on alcohol and cardiovascular disease: still a research priority? *Medical Journal of Australia*, 173(3), 116-117.
- Stockwell, T., Single, E., Rehm, J., & Hawks, D. (1997). Sharpening the focus of alcohol research and policy, from aggregate consumption to harm and risk reduction. *Addiction Research*, 5, 1-9.
- Stockwell, T. R., Daly, A., Phillips, M., Masters, L., Midford, R., Gahegan, M., & Philip, M. (1996). Total versus hazardous per capita alcohol consumption as predictors of acute and chronic alcohol-related harm. *Contemporary Drug Problems*, 23(3), 441-644.
- Williams, P. (1999). *Alcohol-related social disorder and rural youth: Part I - Victims. Report No. 140*. Canberra: Australian Institute of Criminology.
- World Health Organization. (2000). *International guide for monitoring alcohol consumption and alcohol-related harm*. Geneva: World Health Organization.

# Acute alcohol-related harm in Australia

Tim Stockwell, National Drug Research Institute, Curtin University of Technology

## Introduction

The focus of this paper is on the harms caused primarily by the acute effects of alcohol consumption and also the risk factors for such harms. Other papers in this series consider what we know about prevention and harm reduction strategies though, inevitably, these need to be informed by a knowledge of both prevalence and risk factors. In the main acute alcohol-related harm comprises injuries, intentional or unintentional, associated with the impairing effects of alcohol intoxication. Acute harm can also be physical in nature: very high blood alcohol levels can and do result in a significant number of deaths each year, as do complications from drinking 'binges' such as gastritis and pancreatitis. It has been estimated (Stockwell and Single, 1999) that acute alcohol-related conditions contribute almost half of all alcohol-related deaths and two-thirds of Person Years of Life Lost from alcohol. Thus acute alcohol-related harm is of enormous public health significance.

Patterns of alcohol use and their related harms have been studied by numerous disciplines in the health and social sciences. To assist with the task of prioritising future research in this area this paper will attempt to summarise what is known about both the prevalence of acute alcohol-related harm in Australia and also about risk factors for the most common and serious of these harms. In addition, basic research requirements such as the ability to measure and monitor prevalence of harms and major risk factors will be considered. It is recommended that further definition of immediate priorities is determined by the information needs of those government, non-government and private agencies best placed to deliver effective treatment and prevention of acute alcohol-related harm.

Biomedical research priorities will not be considered here. Partly this is due to there already being considerable research funding available for biomedical research on alcohol's effects on the body through the National Health and Medical Research Council. A review of biomedical and biological issues concerning alcohol will be published shortly in 'The International Handbook on Alcohol Dependence and Related Problems' (see Heather et al, in press). There is also an excellent overview in the 10th Special Report on Alcohol and Health to the US Congress (United States Department of Health and Human Services, 2000). Clearly, biomedical research can have major health and social implications and the National Workshop may elect to identify important gaps in this area too.

The distinction between acute and chronic alcohol-related conditions adopted in these discussion papers is a simplification of alcohol epidemiology that is quite widely adopted (e.g. WHO, 2000). The distinction blurs, however, for some conditions in which both regular excessive intake as well as episodes of particularly high intake contribute to risk. The main conditions this applies to are suicide and cardiovascular haemorrhage (stroke). Brief coverage of these conditions will be included here. This paper will employ a definition of acute alcohol-related harm as that which may occur at least partly as a consequence of a single episode of high alcohol intake. The cumulative effects of repeated exposure to such 'binges' over many years, though significant (eg Kauhanen et al, 1997), will not be considered here.

## What are the harms associated with the acute effects of alcohol?

### Analyses of morbidity and mortality data

Perhaps the single most significant piece of research on alcohol conducted in Australia is the well-known review by English et al (1995, updating Holman et al, 1990) which attempted to quantify the relationship between alcohol consumption and all adverse health outcomes. They conducted a systematic review of the international literature on alcohol and health outcomes in order to first identify those health outcomes, positive or negative, that could be causally linked to hazardous or harmful

alcohol consumption (NHMRC, 1992). Using the strongest available evidence, English et al then estimated alcohol aetiologic fractions for each condition that met strict criteria for being causally linked to excess alcohol use. These fractions are estimates of the proportion of all cases of a particular condition that are caused by alcohol. On the basis of fractions calculated for age and sex population sub-sets, estimates of numbers of deaths and hospital admissions caused by alcohol were calculated for 1992.

There have been two recent applications of the English et al methodology to estimate alcohol caused deaths in Australia between 1990 to 1997 (Higgins et al, 2000; Chikritzhs et al, 1999a, 2000a). Only the latter will be reported here since it incorporated two important methodological modifications: (i) the fractions were adjusted downwards to reflect the reduction in per capita alcohol consumption that has occurred during the 1990s (ii) on the advice of the authors of the English et al report, the alcohol fraction for falls in the elderly was set to zero to avoid over-estimating alcohol's contribution to this major type of injury in an age group with the lowest levels of high risk alcohol consumption. Thus a slight underestimate replaced a certain and substantial over-estimate. Estimates of numbers of alcohol-caused deaths classified as 'acute' for the years 1990 to 1997 are shown in Table 1 below. It is apparent from Table 1 that, in descending order, the major alcohol-related causes of death in 1997 were road injuries (417), suicide (263), homicide (124) and drowning (73). It is reasonable to group ethanol toxicity, poisoning and aspiration deaths together as the fatal consequences of extremely high blood alcohol levels - together they accounted for 96 deaths that year.

In relation to trends in these alcohol-caused fatalities during the 1990s, it is apparent that there has been a substantial decline in both alcohol-related road fatalities (34%) and aspiration/toxicity/poisoning (45%). The only significant increase was for suicide deaths attributed to alcohol (14%) though this is likely to reflect changes in other risk factors underlying the general increase in suicide rates in Australia in the last decade. Further research on this important current social and health issue is warranted.

Table 2 provides further details from Chikritzhs et al (1999a) on both alcohol-caused morbidity and mortality for the year of 1997. It is notable that the conditions making the largest contributions to hospital admissions, bed-days and also Person Years of Life Lost (PYLLs) differ from that outlined above for deaths. For PYLLs, road crash injuries are by far and away the major contributor for both men and women (17,174 combined), followed by assaults (4,381), drowning (2,234), falls (1,137) and fire injuries (649). However, when physical conditions associated with very high BACs (aspiration, poisoning, toxicity) are combined these also produce PYLLs in excess of 2,000 years. For hospital episodes, falls account for the largest number (13,525) followed by assaults (8,554) and road injuries (7,789). (All figures quoted here are for males and females combined). Alcohol abuse and alcoholic psychosis are significant contributors to hospital episodes but, arguably, are more appropriately classified as chronic alcohol-related conditions. Similar patterns apply for hospital bed-days.

**Table 1: Estimated total number of alcohol-caused deaths in Australia attributable to short-term High Risk (NHMRC, 1992, hazardous/harmful) alcohol use, by year and condition**

| ICD-9 Codes                     | Cause of death             | 1990        | 1991        | 1992        | 1993        | 1994        | 1995        | 1996        | 1997        |
|---------------------------------|----------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 291                             | Alcoholic psychosis        | 38          | 38          | 41          | 41          | 73          | 71          | 57          | 51          |
| 305.0                           | Alcohol abuse              | 24          | 10          | 15          | 13          | 10          | 16          | 18          | 13          |
| 427.0, 427.2, 427.3             | SV cardiac dysrhythmia     | 8           | 9           | 10          | 11          | 13          | 13          | 16          | 14          |
| 530.7                           | Gastro-oesoph. haemorrhage | 3           | 1           | 1           | 2           | 4           | 3           | 1           | 1           |
| 535.3                           | Alcoholic gastritis        | 3           | 3           | 3           | 1           | 2           | 1           | 3           | 4           |
| 577.0                           | Acute pancreatitis         | 35          | 29          | 33          | 30          | 35          | 35          | 30          | 38          |
| 634                             | Spontaneous abortion       | 0           | 0           | 0           | 0           | 0           | 0           | 0           | 0           |
| 656.5, 764, 765                 | Low birth weight           | 0           | 0           | 0           | 0           | 0           | 0           | 0           | 0           |
| 980.0                           | Ethanol toxicity           | 45          | 33          | 48          | 24          | 25          | 48          | 63          | 37          |
| 980.1                           | Methanol toxicity          | 1           | 1           | 3           | 0           | 0           | 0           | 1           | 0           |
| E810-819                        | Road injuries              | 632         | 552         | 483         | 467         | 453         | 468         | 452         | 417         |
| E860.0                          | Alc. beverage poisoning    | 11          | 4           | 7           | 0           | 0           | 1           | 3           | 0           |
| E860.1, E860.2                  | Other eth/meth poisoning   | 1           | 1           | 0           | 2           | 5           | 0           | 2           | 2           |
| E880-E888                       | Fall injuries              | 56          | 54          | 49          | 47          | 49          | 107         | 56          | 41          |
| E890-E899                       | Fire injuries              | 41          | 51          | 46          | 38          | 45          | 37          | 45          | 34          |
| E910                            | Drowning                   | 71          | 70          | 70          | 75          | 69          | 64          | 62          | 73          |
| E911                            | Aspiration                 | 118         | 93          | 82          | 57          | 67          | 54          | 58          | 57          |
| E919, E920                      | Occupational mach injury   | 5           | 6           | 5           | 4           | 5           | 3           | 4           | 5           |
| E950-E959                       | Suicide                    | 230         | 238         | 223         | 202         | 221         | 229         | 230         | 263         |
| E960, E965, E966,<br>E968, E969 | Assault                    | 157         | 141         | 130         | 123         | 132         | 37          | 130         | 124         |
| E967                            | Child abuse                | 1           | 1           | 1           | 2           | 1           | 1           | 1           | 1           |
| <b>All acute alcohol codes</b>  |                            | <b>1481</b> | <b>1335</b> | <b>1252</b> | <b>1139</b> | <b>1208</b> | <b>1188</b> | <b>1231</b> | <b>1176</b> |

Source: Chikritzhs et al, 1999a

**Table 2: Estimated number of Australian deaths<sup>a</sup> (all ages), Person-Years of Life Lost<sup>a</sup>, hospitalisations<sup>b</sup> and bed-days<sup>b</sup> caused by hazardous and harmful alcohol consumption in 1997, 1996/97 for acute and mixed acute/chronic conditions**

| Condition                              | Males       |              |              |               | Females    |             |              |              |
|--|-------------|--------------|--------------|---------------|------------|-------------|--------------|--------------|
|  | Deaths      | PYLL         | Hosp.        | Bed-days      | Deaths     | PYLL        | Hosp.        | Bed-days     |
| Acute                                  |             |              |              |               |            |             |              |              |
| Falls                                  | 35          | 992          | 8378         | 32699         | 6          | 145         | 5147         | 24149        |
| Assault                                | 84          | 2919         | 6505         | 19921         | 40         | 1462        | 2049         | 5961         |
| Road injuries                          | 343         | 13751        | 6108         | 36651         | 75         | 3423        | 1681         | 8346         |
| Occup. & machine injury                | 4           | 127          | 1301         | 2866          | 0          | 3           | 303          | 817          |
| Fire injuries                          | 24          | 446          | 568          | 4005          | 11         | 203         | 178          | 1823         |
| Drowning                               | 61          | 1909         | 64           | 199           | 12         | 325         | 29           | 65           |
| Child abuse                            | 0           | 10           | 35           | 161           | 0          | 31          | 37           | 185          |
| Alcohol abuse                          | 10          | 309          | 2596         | 6388          | 3          | 96          | 1576         | 4184         |
| Alcoholic psychosis                    | 40          | 358          | 2457         | 40951         | 11         | 35          | 669          | 7387         |
| Alcoholic gastritis                    | 2           | 44           | 856          | 2070          | 2          | 40          | 250          | 536          |
| Aspiration                             | 34          | 498          | 285          | 1189          | 23         | 116         | 234          | 1030         |
| Ethanol toxicity                       | 30          | 1118         | 10           | 20            | 7          | 301         | 27           | 73           |
| Alc. beverage. pois.                   | 0           | 0            | 274          | 581           | 0          | 0           | 194          | 343          |
| Other eth/meth pois.                   | 2           | 87           | 44           | 116           | 0          | 0           | 22           | 63           |
| Acute pancreatitis                     | 20          | 126          | 886          | 5939          | 18         | 57          | 525          | 3877         |
| Gastro-oesoph. haem.                   | 1           | 0            | 366          | 994           | 0          | 0           | 197          | 572          |
| Supr. card. dysrhyth.                  | 5           | 22           | 629          | 1672          | 9          | 5           | 388          | 1389         |
| Spontaneous abortion                   | 0           | 0            | 0            | 0             | 0          | 0           | 6            | 8            |
| Low birthweight                        | 0           | 1            | 3            | 55            | 0          | 1           | 5            | 57           |
| Methanol toxicity                      | 0           | 0            | 0            | 0             | 0          | 0           | 0            | 0            |
| <b>Sub-total</b>                       | <b>695</b>  | <b>22743</b> | <b>31366</b> | <b>156476</b> | <b>218</b> | <b>6246</b> | <b>13517</b> | <b>60865</b> |
| Mixed                                  |             |              |              |               |            |             |              |              |
| Stroke                                 | 312         | 2236         | 2440         | 21122         | 414        | 1783        | 2276         | 22125        |
| Suicide                                | 228         | 7836         | 1023         | 3993          | 36         | 1149        | 845          | 3112         |
| Sub-total                              | 540         | 10076        | 3463         | 25115         | 449        | 2933        | 3122         | 25238        |
| <b>TOTAL</b>                           | <b>1235</b> | <b>32819</b> | <b>34829</b> | <b>181591</b> | <b>667</b> | <b>9179</b> | <b>16639</b> | <b>86103</b> |
| Average number of years lost per death |             |              | <b>26.6</b>  |               |            | <b>13.8</b> |              |              |

<sup>a</sup>mortality data, 1997, <sup>b</sup>morbidity data, 1996/97.

It is interesting to note that alcohol-related injuries in the workplace have been a major focus over the past decade with a review commissioned by the NHMRC (Allsop et al, 1997). These figures suggest that mortality from such injuries is very rare and that alcohol-related morbidity is also far lower than from violence and accidental falls. It is of course possible that falls and violent injuries in the workplace are not usually classified primarily as workplace issues. Indeed Allsop et al's review suggested that there was a lack of well-designed prevalence studies on alcohol and workplace injuries. One reason for the interest in alcohol and the workplace was the work of Collins and Lapsley (1996) who estimated that over 80% of the estimated annual costs of alcohol misuse were born by industry. In fact this figure is almost entirely made up from the estimated lost productivity of persons dying from alcohol-related conditions and is unrelated to whether that alcohol misuse occurred in the workplace.

Clearly, then, when one uses deaths, PYLLs or hospital usage data somewhat different priorities emerge. Each indicator has its special worth for priority setting and not one alone should be relied on. Consistently high prevalence is suggested on all indicators for injuries caused by road crashes and violence and these should remain major priority areas. Even with the small underestimate in this study for estimating alcohol-related falls, these must also be a priority given their substantial contribution to morbidity. Particularly in relation to Potential Years of Life Lost, drowning and the acute effects of intoxication (aspiration, poisoning) are also significant concerns.

### Other data on prevalence of acute alcohol-related harms

Emergency room studies provide more complete data on the victims of violence. Reviewing overseas emergency room studies of alcohol consumption of injured and non-injured attenders, Cherpitel (1993) notes that the majority find significantly higher levels of alcohol consumption among those with injuries. One such study conducted in an emergency department near Sydney's Kings Cross district found that 54% of victims reported having been drinking at the time of their attack and also estimated that 33% of their assailants were under the influence of alcohol (Fulde et al, 1991). The majority of both victims and assailants were young, single, white males and the incidents usually occurred in public places between 9pm and 3am on Thursday, Friday and Saturday nights. Fifteen percent of the victims were female, most of whom were victims of domestic violence, usually perpetrated by their partner.

A recent case-control study of 792 injured people attending a Western Australian Emergency Department found that 22% of these had consumed alcohol in the 6 hours prior to their injury (McLeod et al, 1999, 2000). Taking account of the extent of alcohol consumption among controls, it was estimated that alcohol consumption caused 18% of all injury presentations.

The National Drug Strategy Household Survey has included a small number of relevant questions. The 1998 NDSH survey found that 16% of respondents reported having been threatened with violence and 6% actually physically abused sometime during the previous 12 months by someone who was drunk (AIHW, 1999). A wider variety of 'problems of intoxication' were covered by a random household survey of Perth residents (Stockwell et al, 1993a) covering alcohol-induced road crashes, violence, injury and absence from work. Out of the sample of 872 drinkers, just under 7% reported at least one such problem within the past three months. Most frequently reported were violent incidents followed by time off work and injuries.

Survey data is especially important in estimating the prevalence of violent incidents since only a small proportion of these are reported to police or receive medical treatment. For example, a survey of 461 young patrons of late night drinking venues in Melbourne found that 30% reported being victims of violence there some time in the previous three years. 'Violence' was defined as 'any physical force used by one person on another, for example hitting, pushing or fighting'. However, only 22% of the victims sought formal medical treatment and only 16% reported the incident to the police.

Surveys of high risk groups can also be valuable. In a systematic survey of violent offenders, the New South Wales Police Service found that 77% of public order incidents (assaults, offensive behaviour and offensive language) were "alcohol-related", in so far as perpetrators had consumed alcohol within a few hours prior to the offence (Ireland and Thomenny, 1993). In a survey of 766 patrons leaving late-night venues in Western Australia 7.4% reported having seen 'drunk patrons fighting' inside that evening (Stockwell et al, 1993b).

There is very limited prevalence data on some apparently important acute consequences of alcohol use. There are few studies assessing the extent of alcohol-related injuries in Australian workplaces (Allsop et al, 1997).

A series of in-depth focus groups conducted with groups of young people aged between 12 and 24 and drawn from different parts of Australia, identified a number of significant concerns they had in relation to the immediate (acute) effects of heavy drinking (Shanahan and Hewitt, 1999). The young people were asked, among other things, about negative experiences from drinking in the last 3 months. Nearly 70% of the participants reported “seeing violence by someone who was drunk and aggressive” and 23% of the teenage sample reported having been violent themselves “after drinking too much”. Four out of 10 teenage girls reported “unwanted sexual advances” after drinking too much. As many as 68% reported ‘having to look after friends who had drunk too much’.

It is recommended that future national surveys develop a more comprehensive selection of items to fill some of the gaps identified above.

## **Gaps in knowledge of general prevalence of acute alcohol-related harm**

It should be remembered that the English et al (1995) review was based upon a meta-analysis of published research up to and including the year 1993. Single et al (2000) updated estimates of Relative Risks for some conditions but a systematic repeat of the original meta-analysis is needed to take account of the thousands of reports published since that time which provide new knowledge. While major reviews of this literature exist (e.g. Single et al, 1999) there has been no systematic review which then proceeded to re-estimate Relative Risks and Aetiologic Fractions for Australia. In relation to acute alcohol-related conditions under consideration here, the data available to English et al only permitted crude estimates based on descriptive case series in which the presence of significant alcohol consumption prior to the injury event was estimated. Furthermore, many of these studies were from other countries and conducted in the 1980s. Other weaknesses in this approach for estimating prevalence of acute harm (see eg. WHO, 2000) are as follows:

- a tendency to over-estimate alcohol causation by assuming that the presence of significant prior alcohol consumption necessarily implies causation;
- a tendency to under-estimate alcohol causation by comparing the risk of an injury occurring at a high alcohol intake versus a low intake instead of with abstinence. There is an increased risk of injury even at low levels of alcohol consumption (McLeod et al, 2000);
- a tendency to under-estimate alcohol’s contribution to morbidity and mortality by the exclusion of conditions for which more recent evidence now suggests a firmer causal link to hazardous alcohol use e.g. the role of alcohol in heroin overdose (Darke & Zador, 1996; Zador et al, 1996).

These considerations suggest that an immediate priority is to update the English et al (1995) exercise along with a careful evaluation of a more precise methodology for calculating aetiologic fractions for acute alcohol-related conditions. Such an exercise in itself will then also identify more specific areas of future priority for Australian alcohol research, such as for further Australian case-control studies on the acute consequences of alcohol consumption.

## **Risk factors for acute alcohol-related harm**

### **General risk factors for acute alcohol-related harms**

The major risk factor is clearly hazardous alcohol use defined both in terms of amount consumed on one occasion and other situational and socio-demographic factors which can interact with alcohol use to create additional risk.

Single et al (1999) have reviewed international data on the link between BAC and risk of traumatic injury. They cite evidence that BACs as low as 0.04 g/ml are associated with psychomotor effects

relevant to the risk of an accident e.g. reaction time, cognitive processing, co-ordination and vigilance. Fuller reviews have been conducted by Mann et al (1998) and Eckardt et al (1998). Eckardt et al (1998) report that the amount of alcohol per unit bodyweight required to achieve a BAC may vary from individual to individual by as much as two to three times. Metabolic tolerance to alcohol is one factor here whereby regular drinking induces liver enzymes which metabolise alcohol more rapidly. Functional tolerance to alcohol's effects is also very important in determining individual differences as physiological and behavioural systems adapt to repeated exposure of alcohol in the bloodstream. There is evidence from several studies that occasional heavy drinkers are more prone to injury at a given level of intake than are more regular drinkers (e.g. McLeod et al, 2000), presumably partly as a consequence of having less tolerance to alcohol.

The risk that alcohol consumption poses for acute harm is also apparent at the population level. While the 'International Guide to Monitoring Alcohol Consumption and Related Harm' (WHO, 2000) suggests that per capita alcohol consumption has not always been found to be reliably associated with alcohol-related injuries and accidents, recent Australian and Scandinavian research suggests it is still an important predictor. The first two reports from the National Alcohol Indicators Project found that the 9% decline in per capita consumption in Australia in the early 1990s was accompanied by similar declines in alcohol-caused mortality acute and chronic) (Chikritzhs et al, 1999a) and also in serious alcohol-related road injuries (Chikritzhs et al, 2000 b, c). Skög (in press) conducted a sophisticated time-series analysis on comprehensive trauma data from 14 European countries covering the years 1950 to 1995. He concluded that all-cause accident mortality rates were influenced (to different degrees) by per capita alcohol consumption in Southern, Central and Northern Europe. It would therefore appear that per capita alcohol consumption poses a general risk factor for the general population for acute alcohol-caused deaths.

A comprehensive study of the Western Australian population used both sales and survey data to estimate 'hazardous per capita alcohol consumption' for 130 different areas of the state (Stockwell et al, 1996a). This was a measure of the amount of alcohol consumed by the local population in above risk levels for acute harm (above 4 drinks per day for women and 6 for men). A direct comparison was then made between total per capita alcohol consumption and that proportion estimated to be hazardous as to which best predicted rates of acute alcohol-related problems - road crashes, hospital episodes and violence across the entire state. While both measures were highly correlated, it was found that the measure which took account of the pattern of drinking (ie hazardous per capita consumption) was a better predictor of these harms than was total consumption.

A subsequent analysis of the above data (Stockwell et al, 1998) revealed marked differences between different alcoholic beverages as predictors of local rates of both violence and alcohol-related hospital episodes. Areas with high sales of cask wine and regular strength beers had highest levels of acute harm while areas with high sales of low strength beer tended to have lower harm levels. The authors suggest that the relative prices of the various drinks are the main factor with cask wine being available at as low as 30 cents per standard drink compared with at least one dollar for low alcohol beer, wine and spirits.

On the basis of this last finding, the National Alcohol Indicators Project has as one objective the regular reporting of the proportion of alcohol in Australia consumed in a hazardous fashion. The third NAIP Bulletin (Heale et al, 2000) reports that on the basis of responses to the 1997 National Drug Strategy Household Survey at least 48% of all alcohol consumed is drunk on occasions when drinkers put themselves at risk of acute harm - it is likely to actually be higher than this since the alcohol respondents reported drinking only accounted for 47% of known alcohol sales for that year ie when extrapolated to the entire population. This large proportion of alcohol consumed in a hazardous manner for acute harm is related to the Prevention Paradox (Kreitman, 1986). This refers to the fact that the majority of harm incidents involving alcohol are reported in surveys by people who on average consumed relatively moderate amounts. Subsequent analyses of European (Gmel et al, in press) and Australian (Stockwell et al, 1996b) survey data have shown that one underlying reason is that many of these apparently 'moderate' drinkers are occasional 'binge drinkers' who regularly put themselves at risk of acute harm. Heale et al (2000) estimated, again from national survey data, that 32.5% of Australian female and 46% of male drinkers exceed the 4/6 drink limit at least once per month. For young adult drinkers these proportions are much higher.

At the individual level, a recent Australian case-control study of the role of alcohol and drug use in all-cause injuries presenting to a hospital Emergency Department shed light on both alcohol use and the context of drinking as major risk factors (McLeod et al, 2000). This study was able to determine the independent contributions of setting factors, substance use and socio-demographic characteristics of drinkers to risk of injury. It was found that while men were more likely to be injured, women who drank alcohol were at far greater risk of injury at any given level of alcohol intake. Across both sexes, risk of injury increased significantly after consumption of only 1 to 3 standard drinks but then increased substantially as intake increased above levels defined by NHMRC as hazardous on occasion. Consistent with much other Australian research, Aboriginality was also a significant contributor to increased risk of injury. It was also found that both setting and concurrent activity were crucial in determining risk of injury after drinking alcohol. For example, risk of injury increased after drinking in social settings and on licensed premises but relationships in the workplace and at sporting venues were less clear. Time of day was also a significant factor with drinking at night and at the weekend particularly likely to be associated with injuries.

Earlier West Australian research (Stockwell et al, 1993a) examining risk factors for a range of acute alcohol-related harms reported by a representative community sample found that hazardous alcohol consumption, drinking on licensed premises, being young and being male were all significant factors.

Since hazardous per capita consumption was found to be such a major predictor of acute alcohol-related harm (Stockwell et al, 1996a) and since current surveys under-estimate actual alcohol consumption by about 50%, it is strongly recommended that a) this factor is monitored regularly nationally and in each Australian jurisdiction b) that an early priority is to investigate ways of reducing the discrepancy between estimates of alcohol consumption between survey and sales data so that we have a fuller estimate of hazardous alcohol consumption in Australia. There are a number of promising leads for such research e.g. the higher reports using recent recall methods in some European national surveys as compared with traditional quantity-frequency methods (Knibbe, 2000). Sampling methods to access drinking patterns and volumes of persons usually missed by standard surveys provide another promising lead (WHO, 2000).

### Risk factors for alcohol-related road crashes

As is well known, blood alcohol level is a strong predictor of the risk of a road crash. Pioneering Australian road traffic research has determined the risk of a crash at different BAC levels. McLean et al (1980) used civilian research assistants to determine blood alcohol levels in random samples of drivers tested at different times of day in south Australia. Comparing these data with known BAC levels of persons involved in road crashes it becomes possible to estimate the risk of a crash at different BACs. The most recent Australian study of this kind was conducted by Ryan (2000) in Perth using police Booze Buses at carefully selected times and places. Of the 8,616 drivers tested (there were no refusals!) 1.9% were in excess of 0.05. High risk times for excess BACs were Friday nights and after midnight any day of the week. Comparison with BACs of drivers involved in crashes showed that crash risk increased 5-fold at 0.05, 25 times at 0.08 and 80 times at 0.15.

Other West Australian research has identified drinking on licensed premises as a major risk factor for drink-driving. While only about one-third of alcohol is consumed on licensed premises, as many as 50% of drink-driving offenders and 40% of drivers from alcohol-related crashes (Lang et al, 1989) cite these as the place where they consumed their last drink. Further work in WA identified that some types of venues - nightclubs, hotels and taverns - generate many more drink-driving offenders than do restaurants and social clubs (Stockwell et al, 1992) even when level of alcohol sales is taken into account. Degree of 'risk' has been found to vary greatly between venues of the same licence type (Stockwell, 1997) and it is usual in any given area to find that just two or three premises generate 80% of the all drink-driving offenders who last drank on licensed premises. Samples of drinkers leaving high risk late night venues in Perth were significantly more likely to have BACs above 0.15 (Stockwell et al, 1992). While it is true that in the case of nightclubs much prior consumption will have occurred at other venues (including private homes), from a prevention point of view it is important to know the places where highest BACs are obtained so drink-driving deterrence strategies can be better directed.

International and Australian research has consistently confirmed that young males are the highest risk group for drink-driving (e.g. Chikritzhs et al, 2000 b, c). Furthermore, consumption of beer rather than wine or spirits is a predictor of drink-driving behaviour (e.g. Gruenewald et al, 1999). A number of studies have indicated both higher alcohol consumption and propensity to drink and drive among people living in rural Australia (eg Beel et al, 1995). Concern has been expressed regarding the increasing proportion of women charged with drink-driving in Australia (Copeland, 1999). While this trend may well reflect underlying changes in drink-driving behaviour of women, it needs also to be determined whether a trend towards more random and less targeted breath-testing strategies is also responsible. Drink-driving enforcement practices change and will influence the profiles of persons caught drinking and driving.

The 1998 National Drug Strategy Household Survey (AIHW, 1999) showed a worrying trend for an increase in the proportion of people reporting having driven a car while under the influence of alcohol in the past 12 months. For men the percentage of respondents admitting this increased from 14% to 24% and for women 7% to 11%.

### Risk factors for alcohol-related violence

While the link between excess alcohol use and road trauma is well-accepted, the causal nature of the association between drinking alcohol and violence is still sometimes questioned (e.g. Wallace et al, 1994; D'Abbs et al, 1994). However, it is increasingly apparent that the evidence in favour of a direct causal association is strong and consistent, though it is one which can be heavily influenced by external, situational variables too (Homel et al, in press; Graham & West, in press; United States Department of Health and Human Services, 2000). This evidence comes from qualitative studies involving victims of violence (e.g. Wallace et al, 1994; Graham et al, 2000), persons working at late night venues (Stockwell, 1995), human and animal experiments (White and Humeniuk, 1994), national surveys (Greenfield, 1998), emergency room studies (Cherpitel, 1997) and also systematic observations of bars with a reputation for violence (Graham and Homel, 1997). The 10th Special Report on Alcohol and Health to the US Congress (United States Department of Health and Human Services, 2000) concludes that the evidence for a causal relationship is strong for both physical and sexual assaults and for homicide, though is less clear in relation to domestic violence.

A number of research groups have developed models which allow that alcohol use is one of a complex set of factors which contribute to violence, no one of which is either a necessary or sufficient condition. Homel et al (1992) cite a combination of crowding, a predominantly young male crowd, boring entertainment, aggressive bouncers, cheap drinks and high levels of intoxication as a particularly risky combination. More recently, other theoreticians have developed models for the ways in which alcohol can interact with social norms and social context to increase the risk of violent outcomes in situations in which there already exists the potential for violence (Parker and Rebhun, 1995; Graham et al, 1998).

Particularly in relation to domestic violence, the causal role of alcohol has often been played down for fear of implying diminished responsibility by perpetrators. For example, Wallace et al (1994) concluded that alcohol use was only associated with domestic violence in some instances and not in a causal way. This was despite the fact that their study included reports from the victims of domestic violence who identified (through both prompted and unprompted recall) that alcohol use was the most frequent trigger of violent incidents. Female Aboriginal victims of domestic violence were particularly adamant that alcohol played this role. The report's authors, however, argued that since violence sometimes occurred when no alcohol had been consumed, and since violence did not invariably occur with drinking and was sometimes less likely to occur when small amounts were consumed, that this did not imply a causal role. Certainly their data suggest, as with alcohol and road crashes, that alcohol consumption of and by itself is not a sufficient condition for domestic violence to occur, but they are highly indicative of a contributory causal role for alcohol.

There is consistent evidence from many sources that young males are especially prone to engaging in violence after drinking (Homel et al, 1992; Graham & West, in press). Some late night licensed drinking venues are especially likely to be a focus for violent behaviour. Ireland and Thomenny (1993) found that

91% of assaults occurring in public places between 10am and 2pm were in or adjacent to licensed premises. A Western Australian study examined the location of assaults as stated in police records and found that nightclubs, taverns and hotels were 'high risk' for assaults in comparison with restaurants and social clubs (Stockwell et al, 1992). A measure of annual alcohol sales was used to control for the effects of different volumes of business at each of the different types of establishments. Subsequent research in both New South Wales (Stevenson et al. 1999) and Western Australia (Stockwell et al, 1998) confirmed that local levels of alcohol sales (especially of beer and cask wine) were closely associated with local levels of violence.

It can be concluded that intoxication from alcohol can increase the risk of violence occurring in situations where there is already a degree of conflict or frustration around human interactions. Late night drinking venues are one example of a setting with the potential for violence to occur, especially those frequented by groups of young men who are strangers to each other, where crowding is permitted, staff are poorly trained, intoxication is not discouraged and entertainment is poor.

### Risk factors for other acute alcohol-related harms

Allsop et al (1997) identify certain occupational groups and settings as being at special risk of alcohol-related harms. In general these are occupations where there is ready availability of alcohol, low levels of supervision and a culture supportive of heavy drinking. Examples of such occupations include employment in the retail alcohol industry, journalism, the armed and police services.

A perhaps more significant cause of alcohol-related harm might be termed 'alcohol overdose' - poisoning, toxicity etc. A recent study of an Australian tertiary institution documented students involvement in high risk drinking and, in particular, high risk drinking games (Pollizotto et al, in press). A variety of verbal, physical and passive games were identified which involved participants being required to drink on certain cues. The research was prompted by the well-publicised death of a young man after participating in such a game. A survey was distributed to students with 357 out of 376 being returned (a 95% response rate). Three-quarters of respondents had participated in a drinking game at some time during which males drunk an average of 13 standard drinks and females 8. Nearly all (89%) reported being present when someone had lost consciousness from drinking too much. In most instances the unconscious person was left to sleep off the effects and was not monitored.

## Monitoring of acute alcohol-related harm

### National monitoring

Guidelines have been published by the World Health Organization (2000) providing advice to member countries on how to monitor alcohol consumption and related harm. The production of these guidelines was coordinated by Australia's National Drug Research Institute. Summary advice is provided in relation to both acute and chronic harms as well as in relation to the underlying patterns of risky drinking for countries which variously have Low, Medium, High or Optimal levels of resources for such an activity. Table 3 summarises the advice for a country with optimal resources all of which should be achievable for Australia

**Table 3: Summary of additional recommendations for national monitoring systems with an OPTIMAL level of allocated resources**

| <b>Chronic Harms:</b><br>Problems caused by long term heavy use  | <b>Acute Harms:</b><br>Problems caused by occasions of intoxication   | <b>Volume of alcohol consumption</b>   | <b>High risk alcohol consumption</b> |
|--|---|--|--------------------------------------|
| <ol style="list-style-type: none"> <li>1. Annual rates of above expressed as deaths, PYLLs, DALYs, hospital bed-days and economic costs.</li> <li>2. 3-yearly estimates of total economic costs of harm</li> <li>3. Rates of alcohol dependence using SADQ-C or CIDI-C and of alcohol problems by WHO problem scale, as part of 3 yearly national survey.</li> </ol> | <ul style="list-style-type: none"> <li>• Rates of above conditions expressed as deaths, PYLLs, DALYs, admissions, hospital bed-days and economic costs.</li> <li>• Rates of fatal and serious road crashes with BACs &gt;0.05/0.10%</li> <li>• Self-reported rates of personal and social problems from 3 yearly national survey</li> </ul> | <ol style="list-style-type: none"> <li>(i) Per capita alcohol consumption also adjusted for imports, visitor consumption and home production applying the Graduated Quantity-Frequency method to estimate.</li> <li>(ii) Graduated Quantity X Frequency estimate with alcohol content of drinks derived informally from local data.</li> </ol> | As above.                            |

The National Alcohol Indicators Project (NAIP) has the objective of developing such national indicators for Australia. The underlying methodology has been summarised and reviewed by Stockwell et al (in press). This project was conceived by the National Expert Advisory Committee on Alcohol and is incorporated into the current draft National Alcohol Action Plan (Commonwealth Department of Health and Aged Care, 2000). Thus far, progress has been made in the development of national and jurisdictional indicators of the following varieties of acute harm:

- alcohol-caused mortality, 1990-1997 (Chikritzhs et al, 1999a, 2000a);
- alcohol-related serious and fatal road injuries (Chikritzhs et al, 2000b, c);
- proportion of all alcohol consumed above risk levels for acute harm (Heale et al, 2000).

Future reports will present indicators of alcohol-related violence, namely rates of night time assaults and hospital admissions for injuries caused by assaults. Due to the difficulty with obtaining reliable medical and police data on direct alcohol-involvement in such incidents case-by-case, night-time incidents are a good indicator or surrogate measure of alcohol-related violence. Independent studies have confirmed that night-time violent events in Australia tend to have a high alcohol-involvement (Ireland and Thomenny, 1993; Stockwell et al, in press).

It is recommended that these indicators are further developed and that responsibility for reporting these on a regular basis for all states and territories is taken by the appropriate authorities ie the National Crime Statistics Unit (night-time assaults), the Australian Institute of Health and Welfare (morbidity and mortality) and the Federal Office of Road Safety (alcohol-related road injuries). In each case the NAIP has developed new measures or refined existing ones. It is also recommended that further work be conducted which examines the reliability and validity of these measures in order to identify an optimal set of annual indicators for Australia.

In keeping with the WHO guidelines identified in Table 3 above, it is also recommended that economic cost estimates of the extent of alcohol-related harm are made on an annual base for each jurisdiction. These data are important to maintain the visibility of alcohol's contribution to serious acute and chronic alcohol-related harm and to inform efforts to prevent and reduce these harms.

## Local monitoring

There have been a number of efforts in Australia in recent years to develop and report on local levels of alcohol consumption and harm. Turning Point's Epi-Centre group have reported on these to inform local action and licensing decisions (Hanlin et al, 1999). The National Drug Research Institute (NDRI) developed a set of indicators from the Measurement of Alcohol for Policy Project (Stockwell et al, 1995) similar to those identified above for national indicators. This study found that night-time assaults and a general measure of acute morbidity were both strongly related to local levels of per capita alcohol consumption. A more recent study from NDRI was the WA Liquor Licensing Demonstration Project in which the viability of there being an exchange of these data between police, health and liquor licensing authorities was established. Gruenewald et al (1997) have provided a useful guide to the application of an indicators approach to the monitoring of local prevention initiatives.

Local data is particularly important as a resource for local prevention initiatives. It is recommended that guidelines for best practice in the local monitoring of alcohol-related harm and consumption are developed which take account of the availability of relevant data sets in Australia.

## In closing

There has been a strong tradition of Australian research concerned with acute alcohol-related harm in the past decade. Major areas of interest have included:

- estimates of the overall prevalence of all acute harms as well as of specific varieties, ie road crashes, violence;
- studies of risk factors for alcohol-related crashes and violence;
- studies of high risk drinking settings; and
- methods of monitoring levels of harm for policy development and evaluation purposes.

A number of specific directions for future research are suggested that emerge from what has been conducted to date. The focus of these proposals is on improving our understanding of risk factors and the facility to monitor levels of acute alcohol-related harm at the national, state and local levels. These include:

- A reliable and valid scale measuring prevalence of a comprehensive range of general and specific acute harms is developed for regular application within existing national surveys, ideally the National Drug Strategy Household Survey.
- A nationally agreed standard method is developed for estimating alcohol-caused acute harm which makes allowance for changing patterns of risky drinking behaviour. This would prevent the reporting of inconsistent estimates by different authorities. It would also recognise that current methods are crude and likely to be unreliable until more case-control studies have been conducted in Australia for major types of acute alcohol-related conditions.

- More basic research on prevalence and risk is needed on alcohol-caused overdose (with and without other drugs such as heroin), drowning, suicide and work-related injuries. Case-control and case-cross-over designs would be ideal in order to estimate the risk associated with different behavioural, social, situational and demographic risk factors.
- Continued development, validation and standardisation of both local and national indicators of alcohol-related harm as a resource for policy development and evaluation. These should cover the major domains of harm ie alcohol-related violence, road trauma, suicide and injuries from other causes.

## References

Allsop, S., Bush, R., Phillips, M., Midford, R., Vincent, N., Ask, A., Duffy, J., Bailey, M., Fowler, G. And Sirenko, A. (1997) *Alcohol and Other Drugs in the Australian Workplace: a Critical Literature Review*, Bedford Park: National Centre for Education and Training on Addiction.

Australian Institute of Health and Welfare (AIHW) (1999) *1998 National Drug Strategy Household Survey: first results*. Canberra: Australian Institute of Health and Welfare.

Beel, A. and Stockwell, T. (1995) *The Impact of Western Australia's .05 Legislation on Drivers' Attitudes, Perceptions and Behaviours*. National Centre for Research into the Prevention of Drug Abuse, Curtin University of Technology, Perth, WA.

Cherpitel, C. (1997) Alcohol and violence-related injuries in the emergency room. In: Galanter, M., ed. *Recent developments in Alcoholism. Vol. 13, Alcohol and Violence: Epidemiology, Neurobiology, Psychology and Family issues*. New York, NY: Plenum Press. pp. 105-118.

Cherpitel, C.J. (1993) Alcohol and injuries: a review of international emergency room studies. *Addiction*, 88, 7, 923-937.

Chikritzhs, T., Jonas, H., Heale, P., Dietze, P., Hanlin, K. and Stockwell, T. (1999a) *Alcohol-caused deaths and hospitalisations in Australia*. National Alcohol Indicators Project, Bulletin No. 1. National Drug Research Institute, Perth: Curtin University of Technology.

Chikritzhs, T., Jonas, H., Heale, P., Stockwell, T., Dietze, P., Hanlin, K. and Webb, M. (2000a) *National Alcohol Indicators Project Technical Report No. 1: Alcohol-caused deaths and hospitalisations in Australia, 1990-1997*. National Drug Research Institute, Curtin University of Technology, Perth, WA.

Chikritzhs, T., Stockwell, T.R., Heale, P., Dietze, P. and Webb, M. (2000b) *Trends in alcohol-related road injury in Australia, 1990-1997*. National Alcohol Indicators Project, Bulletin No. 2. National Drug Research Institute, Perth: Curtin University of Technology.

Chikritzhs, T., Stockwell, T.R., Heale, P., Dietze, P. and Webb, M. (2000c) *Trends in alcohol-related road injury in Australia, 1990-1997: Technical Report*. National Alcohol Indicators Project, National Drug Research Institute, Perth: Curtin University of Technology.

Collins, D.J. and Lapsley, H.M. (1996) *The social costs of drug abuse in Australia in 1988*. Canberra: Australian Government Publishing Services.

Commonwealth Department of Health and Aged Care (2000) Draft National Alcohol Action Plan. National Drug Strategy Unit, Canberra.

Copeland, J. (1999) Women and drink driving. *Drug and Alcohol Review*, 18, 113-114.

D'Abbs, P., Hunter, E., Reser, J. & Martin, D. (1994) *Alcohol-related violence in Aboriginal and Torres Strait Islander communities: a literature review*. Report 8 in a series of reports prepared for the National Symposium on Alcohol Misuse and Violence. Canberra: Australian Government Publishing Service.

Darke, S. & Zador, D. (1996) Fatal heroin 'overdose': a review. *Addiction*. 91(12),1765-1772.

Eckardt, M.J., File, S.E., Gessa, G.L., Grant, K.A., Guerri, C., Hoffman, P.L., Kalant, H., Koop, G.F., Li, T.K. and Tabakoff, B. (1998) Effects of moderate alcohol consumption on the central nervous system. *Alcoholism, Clinical & Experimental Research* 22, 998-1040.

- English, D.R., Holman, C.D.J, Milne, E., Winter, M.G., Hulse, G.K., Codde, J.P., Bower, C.I., Corti, B., De Klerk, N., Knuiiman, M.W., Kurinczuk, J.J., Lewin, G.F. & Ryan, G.A. (1995) *The Quantification of drug caused morbidity and mortality in Australia, 1995 edition*. Commonwealth Department of Human Services and Health, Canberra.
- Fulde, G., Cuthbert, M. and Kelly, R. (1991) Violence in society: fact or fiction. *Emergency Medicine*, 3, 37-80.
- Gmel, G., Klingemann, S., Müller, R. & Brenner, D. (in press) Revising the preventive paradox: the Swiss case. *Addiction*.
- Graham, K. and Homel, R. (1997) Creating Safer Bars. In Plant, M., Single, E. and Stockwell, T. (Eds) *Alcohol: Minimising the Harm*. Free Association Press, London, pp. 171-192.
- Graham, K. and West, P. (In Press) Alcohol and crime: examining the link. In N. Heather, T.J. Peters, and T. Stockwell (Eds.), *International handbook of alcohol problems and dependence*. West Sussex, U.K: John Wiley & Sons, Ltd.
- Graham, K., West, P. and Wells, S. (2000) Evaluating theories of alcohol-related aggression using observations of young adults in bars. *Addiction*, 95, 6, 847-863.
- Graham, K., Leonard, L.F., Room R., Wild, T.C., Pihl, R.O., Bois, C. and Single, E. (1998) Current directions in research on understanding and preventing intoxicated aggression. *Addiction*, 93 (5): 659-676.
- Greenfield, T. (1998) *Alcohol and Crime: An analysis of national data on the prevalence of alcohol involvement in Crime*. Report prepared for Assistant Attorney General's National Symposium on Alcohol Abuse and Crime, Washington, DC: U.S. Department of Justice.
- Gruenewald, P., Stockwell, T., Beel, A. and Dyskin, E. (1999) Beverage sales and drinking and driving: the role of on-premise drinking places. *Journal of Studies on Alcohol*, 60 (1) 47-53.
- Gruenewald, P.J., Treno, A.J. Taff, G. and Klitzner, M. (1997) *Measuring Community Indicators: A systems approach to drug and alcohol problems*. Applied Social Research Methods Series, volume 45. Sage Publications: London.
- Hanlin, K. , Cvetkovski, S. , Dietze, P. , Laslett, A-M. , Rumbold, G. (1999) *The Victorian Alcohol Statistics Handbook: alcohol consumption and alcohol-related hospital admission in Victoria: 1994/95-1995/6*. Turning Point Alcohol and Drug Services Inc, Fitzroy Victoria
- Heale, P., Stockwell, T., Dietze, P., Chikritzhs, T. and Cronin, J. (2000) *Alcohol Consumption in Australia above low risk limits for health. National Alcohol Indicators Project*. Bulletin No. 3. National Drug Research Institute, Curtin University of Technology, Perth, WA.
- Heather, N., Peters, T.J. and Stockwell T. (Eds.) (In press) *International Handbook of Alcohol Problems and Dependence*. John Wiley & Sons, Ltd, West Sussex, U.K.
- Higgins, K., Cooper-Stanbury, M. and Williams. P. (2000) *Statistics on drug use in Australia 1998*. Australian Institute of Health and Welfare, Canberra.
- Holman, D., Armstrong, B., Arias, L., Martin, C. Hatton, W., Hayward, L., Salmon, M., Shean, R. and Waddell, V. (1990) *The quantification of drug caused morbidity and mortality in Australia, 1988 Part 1*. Department of Community Services and Health. Canberra: Australian Government Publishing Service.
- Homel, R., McIlwain, G. and Carvolth, R. (in press) Creating safer drinking environments. In N. Heather, T.J. Peters, & T. Stockwell (Eds.), *International handbook of alcohol problems and dependence*. West Sussex, U.K.: John Wiley & Sons, Ltd.
- Homel, R., Tomsen, S. and Tommeny, J. (1992) Public drinking and violence: Not just an alcohol problem. *The Journal of Drug Issues*, 22 (3), 679-697.

- Ireland, C.S. and Thommeny, J.L. (1993) The crime cocktail: Licensed premises, alcohol and street offences. *Drug and Alcohol Review*, 12, 2, 143-150.
- Kauhanen, J., Kaplan, G.A., Goldberg, D.E., Cohen, R.D., Lakka, T.A. and Salonen, J.T. (1997) Frequent hangovers and cardiovascular mortality in middle-aged men. *Epidemiology*, 8, 310-314.
- Knibbe, R. (2000) *Alcohol consumption estimates in surveys in Europe: comparability and sensitivity for gender differences*. Paper presented at "Measuring drinking patterns, alcohol problems, and their connection: an international research conference", Sharpo, Stockholm, 3-7 April 2000.
- Kreitman, N. (1986) Alcohol consumption and the Preventive Paradox. *British Journal of Addiction* 81, 3, 353-364.
- Lang, E., Stockwell, T. and Lo, S.K. (1989) *Drinking locations of drink-driving offenders in Perth metropolitan area*. Technical Report. Prepared for the Western Australian Police Department by the National Centre for Research into the Prevention of Drug Abuse, Curtin University of Technology, Perth, WA.
- Mann, R., Macdonald, S. and Bondy, S. (1998) *Assessing the potential impact of lowering the legal blood alcohol limit to 50 mg% in Canada* (Draft report to Health Canada. Toronto: Addiction Research Foundation.
- Mclean, A.J., Holubowycz, O.T. & Sandow, B.L. (1980) *Alcohol and crashes: identification of relevant factors in this association*. Report No. CR11. Adelaide: Dept. of Transport, University of Adelaide.
- McLeod, R., Stockwell, T., Stevens, M. & Phillips, M. (1999) The relationship between alcohol consumption patterns and injury. *Addiction*, 94 (11), 1719-1734.
- McLeod, R., Stockwell, T., Stevens, M., Phillips, M. and Jellinek, G. (2000) *Alcohol and Injury: a case control study*. National Drug Research Institute Technical Report, Curtin University of Technology, Perth, WA.
- National Health and Medical Research Council (1992) *Is there a safe level of daily consumption of alcohol for men and women?* Canberra: AGPS
- Parker, R.N. and Rebhun, L.A. (1995) *Alcohol and Homicide: A deadly combination of two American traditions*. Albany, NY: State University of New York Press.
- Pollizotto, M., Saw, M., Tjhung, I., Chua, E.H., Straton, J. and Stockwell, T. (In press) Fluid Skills: the role of drinking games in the alcohol consumption patterns of Western Australian youth. *Contemporary Drug Problems*.
- Ryan, G.A. (2000) *A road side survey of drinking drivers in Perth, Western Australia*. Report RR94. Road Accident Prevention Research Unit, Department of Public Health, The University of Western Australia.
- Shanahan, P. and Hewitt, N. (1999) *Developmental research for a national alcohol campaign*. A report commissioned by the Commonwealth Department of Health and Aged Care, Canberra: Australian Government Publishing Services.
- Single, E., Ashley, M.J., Bondy, S., Dobbins, M., Rankin, J. and Rehm, J. (1999) *Evidence regarding the level of alcohol consumption considered to be low-risk for men and women*. Report prepared for the Australian Commonwealth Department of Health and Aged Care. NHMRC, Canberra.
- Single, E., Rehm, J., Robson, L., Van Truong, M. (2000) The relative risks and etiologic fractions of different causes of death and disease attributable to alcohol, tobacco and illicit drug use in Canada. *Canadian Medical Association Journal*, 162, 12, 1669-1675.
- Skög, O-J. (in press) Alcohol consumption and overall accident mortality in 14 European countries. *Addiction*.
- Stevenson, R.J., Lind, B. and Weatherburn, D. (1999) The relationship between alcohol sales and assault in New South Wales, Australia. *Addiction*, 94 (3), 397-410.
- Stockwell, T. (1995) Alcohol, violence and licensed premises: the nature of the relationship. In T. Stockwell (Ed), *Alcohol misuse and violence report 5: An examination of the appropriateness and efficacy of liquor licensing laws across Australia*. (pp.105-118). Canberra: Australian Government Publishing Service.

- Stockwell, T. (1997) Regulation of the licensed drinking environment: a major opportunity for crime prevention. *Crime Prevention Studies*, 7, 7-33.
- Stockwell, T. and Single, E. (1999) Reducing harmful drinking. In: Peele, S. & Grant, M. (Eds) *Alcohol and pleasure: A health perspective*. (pp. 357-374) Philadelphia, PA: Taylor & Francis.
- Stockwell, T., Chikritzhs, T. and Brinkman, S. (In press) The role of social and health statistics in measuring harm from alcohol. *Journal of Substance Abuse*.
- Stockwell, T., Hawks, D., Lang, E. and Rydon, P. (1996b) Unravelling the preventive paradox for acute alcohol problems. *Drug and Alcohol Review*, 15, 1, 7-15.
- Stockwell, T., Lang, E., Rydon, P. and Lockwood, A. (1993a) High risk drinking settings: the association of serving and promotional practices with harmful drinking. *Addiction*, 88, 11, 1519-1526.
- Stockwell, T., Masters, L., Phillips, M., Daly, A., Gahegan, M., Midford, R. and Philp, A. (1998) Consumption of different alcoholic beverages as predictors of local rates of night-time assault and acute alcohol-related morbidity. *Australian and New Zealand Journal of Public Health*, 22 (2), 237-242.
- Stockwell, T., Rydon, P., Lang, E. and Beel, A. (eds). (1993b) *An evaluation of the "Freo Respects You" responsible alcohol service project*. Technical Report. Perth: National Centre for Research into the Prevention of Drug Abuse.
- Stockwell, T., Somerford, P. and Lang, E. (1992) The relationship between licence type and alcohol-related problems attributed to licensed premises in Perth, Western Australia. *Journal of Studies on Alcohol*, 53, 5, 495-498.
- Stockwell, T.R., Daly, A., Phillips, M., Masters, L., Midford, R., Gahegan, M. and Philip, M. (1996a). Total versus hazardous per capita alcohol consumption as predictors of acute and chronic alcohol-related harm. *Contemporary Drug Problems*, 23, (3), pp. 441-464
- Stockwell, T.R., Masters, L., Phillips, M., Daly, A., Gahegan, M., Midford, R., Gruenewald, P., Gilchrist, J. and Philp, A. (1995). *The Measurement of Alcohol Problems for Policy (MAPP): a first report of research in progress*. National Centre for Research into the Prevention of Drug Abuse, Division of Health Sciences, Curtin University of Technology, Perth, Western Australia.
- United States Department of Health and Human Services (2000) *10th special report to the U.S. Congress on alcohol and health from the secretary of health and human services*. Washington, DC: U.S. Department of Health and Human Services, Public Health Service, National Institute of Health, National Institute on Alcohol Abuse and Alcoholism.
- Wallace, A., Egger, S., Howard, J., Fishwick, E., Roberts, G., Klein, L., McMillan, L. and Drake, R. (1994) Violence against women and children in the home. *Proceedings of National Symposium on alcohol misuse and violence Report 4*. Australian Government Publishing Service, Canberra.
- White, J.M. & Humeniuk, R. (1994) Alcohol-related violence; exploring the relationship. *Proceedings of National Symposium on alcohol misuse and violence, Report 2*. Australian Government Publishing Service, Canberra.
- World Health Organization (2000) *International guidelines for monitoring alcohol consumption and harm*, Substance Department, WHO, Geneva
- Zador, D., Sunjic, S. and Darke, S. (1996) Heroin-related deaths in New South Wales, 1992: Toxicological findings and circumstances. *Medical Journal of Australia*, 164:204-207.

# Long-term consequences of alcohol consumption

Anne-Marie Laslett, Susan Donath, Paul Dietze, Turning Point Alcohol & Drug Centre Inc.

## Introduction

There are a variety of effects associated with the long-term consumption of alcohol. While these effects are evident across both individual and social domains, research has generally focused on the biomedical consequences of long-term alcohol consumption such as liver cirrhosis and heart disease. This paper is designed to examine some of the effects of long-term alcohol consumption with a view to identifying some of the major research questions that require further investigation in the Australian context. The paper is based on published literature on the long-term effects of alcohol consumption.

### Conceptual framework

The biological and psychopharmacological effects of alcohol's action in the brain can result in behavioural changes for an individual which can in turn affect social interactions and bring about societal responses (Rehm & Fischer, 1997). The consumption of alcohol also has the potential to affect a range of other biochemical and physiological processes, to cause pathology in a number of the body's organs, or interact with other compounds to damage or protect organs. As an aid to understanding the considerable body of research and evidence on the long-term consequences of alcohol consumption we have chosen to consider the research within three broad domains, namely: (1) biomedical; (2) psychological; and (3) social.

In this paper the effects of single occasion use (generally intoxication) or acute consequences are distinguished from consequences chronic use (i.e. harm associated with long term use of alcohol) with a focus upon the latter. However, it is recognised that this distinction is sometimes difficult to maintain. For example, long-term regular alcohol users are at a higher risk of 'acute' consequences than more sporadic drinkers, because of the higher frequency with which they experience episodes of intoxication. In addition, whilst a single intoxicated event may result in acute harm, the recurrence of acute harm associated with alcohol use (eg violence, injury) in a family, workplace, community or society can result in chronic disruption or disintegration within these contexts, and this effect is the result of more than a single episode of intoxication. Where possible this paper will concentrate on the consequences of the cumulative effects of alcohol, for example the consequences of regular light, heavy or binge drinking patterns. Injuries, violence and crimes that occur whilst individuals are intoxicated will be considered generally as acute harms and be covered in other papers of this series.

### Search strategy

The paper should not be seen as a comprehensive review of the area - instead it represents a targeted examination of the literature in order to examine major issues for future research. A number of reference databases (Medline, Psychlit and other library databases) were examined using a variety of keywords in order to identify target publications for this paper. These more comprehensive searches were generally limited to Australia for the 1990-2000 publication years with a more parsimonious approach taken with regard to the examination of the overseas literature. In this regard review papers (eg Single et al., 1999) were used as the main sources of overseas literature.

## Long-term alcohol consumption in Australia

Whilst other papers in this series describe issues related to different patterns of alcohol consumption, a working definition of long-term alcohol use is necessary in order to review research on the consequences of such use. In Australia two risk categories have been devised in order to specify problematic long-term regular drinking: (1) hazardous alcohol consumption - defined as being between

three and four drinks per day for females and between five and six drinks per day for males (on average), and (2) harmful alcohol consumption - defined as being above four drinks per day for females and above six drinks per day for males (on average) (Pols & Hawks, 1992). In the 1998 National Drug Strategy Survey it was estimated that 4.6% of the population drank at medium (hazardous) risk levels and 2.5% at high (harmful) risk levels (Heale, Stockwell, Dietze, & Chikritzhs, 2000). However, much of the research on the long-term consequences of regular drinking uses different definitions, including those related to specific diagnostic instruments (eg DSM-IV) such as alcohol dependence, or the more generic term 'alcoholic'. Definitions of other consumption patterns of public health interest (eg binge drinking) are currently under development (National Health and Medical Research Council, 2000). Where possible, the long-term consequences of other risky patterns of alcohol use will be considered. It is long-term regular binge drinking in particular that will be considered in this regard. The most recent National Drug Strategy Survey indicates that over 12% of recent drinkers (people who have had at least one alcoholic drink in the past year) have had more than 7 drinks on the one occasion, and almost 10% of these recent drinkers report doing so on at least a weekly basis (Australian Institute of Health and Welfare, 1999).

In considering the published literature on the long-term consequences of alcohol consumption a number of caveats need to be understood. Much of the literature assumes that reported patterns of drinking are stable, over often undefined and highly variable periods (with the exception of cohort studies, where the period is defined, although again the pattern may or not be stable). In this regard the definition of long-term alcohol consumption has not been adequately clarified and varies from study to study. Research regarding drinking pattern over the life span and the stability of drinking patterns in the Australian setting would serve to support or refute assumptions regarding patterns of drinking and long term consequences.

A number of demographic, social and cultural factors, for example, age, sex, social class, occupation, are known to be associated with long-term alcohol consumption. Often it is difficult to determine whether these factors are markers of different patterns of use and/or factors which interact with alcohol (via a specific biological/genetic mechanism) to increase or decrease risk of alcohol-related harm or benefit.

These factors will be examined more specifically in relation to the consequences considered below.

## The consequences of long-term alcohol use

### Biomedical consequences of long-term alcohol consumption

The long-term biomedical consequences of alcohol consumption have been studied via a number of different disciplines, at the cellular, physiological and population level. While there are a number of Australian studies, the vast majority of the research available on the biomedical consequences of alcohol use has been conducted overseas. Epidemiologic studies have examined the dose-response relationship between average alcohol consumption and a variety of specific diseases using case-control and cohort methodologies. There is strong evidence from these studies that heavy patterns of consumption are associated with increased overall mortality (Doll, 1998; English et al., 1995; Her & Rehm, 1998) and many individual diseases (Corrao, Bagnardi, Zambon, & Arico, 1999; English et al., 1995). On the other hand lower overall mortality (Doll, 1998; English et al., 1995), longer overall survival (Simons, McCallum, Friedlander, & Ortiz, 2000) and lower mortality associated with ischaemic heart disease (Doll, Pet, Hall, Wheatley, & Gray, 1994; McElduff & Dobson, 1997) have been found in association with light to moderate drinking. The relationship between all-cause mortality and alcohol consumption is best summarised in a J or U shaped curve (English et al., 1995), although it is not clear whether this is applicable to all sub-populations in Australia.

With respect to specific diseases the international and national research evidence regarding alcohol and its consumption in both the short and long term has been summarised by Single et al.(1999) as part of the process of the development of the NHMRC Australian Drinking Guidelines (National Health and Medical Research Council, 2000). Their findings, along with those of English et al.(1995), have been summarised here and are grouped into harmful and beneficial consequences of long-term alcohol use.

## Harmful consequences

Long-term heavy alcohol consumption is associated with stroke (ischaemic and particularly haemorrhagic stroke), hypertension, cardiomyopathy, “holiday heart” syndrome, cardiac arrhythmias, congestive heart failure and sudden death (Single et al., 1999). Strong associations have also been identified between cancers of the mouth, pharynx, larynx and oesophagus and alcohol even at low levels of consumption, with risk increasing with dose (English et al., 1995; Single et al., 1999). Cancer of the liver has been shown to be associated with increasing alcohol intake, although it has been postulated that the role of alcohol is an indirect one (English et al., 1995; Single et al., 1999). Cancers of the stomach and pancreas have not been shown to be associated with alcohol intake, despite associations between drinking and inflammation of these organs (English et al., 1995; Single et al., 1999). Cancers of the colon and rectum have consistently but weakly been shown to be associated with alcohol intake but there is no evidence of a direct causal role (English et al., 1995; Single et al., 1999). Cancers of the breast have been inconsistently linked to alcohol, although recent studies have shown more evidence supportive of a weak association. Reviewers have tended to conclude that sufficient evidence exists to link alcohol consumption with breast cancer and increased risk of cancer overall (English et al., 1995; Single et al., 1999).

Alcohol consumption at hazardous or harmful levels has been associated with liver cirrhosis (English et al., 1995; Single et al., 1999). Alcohol consumption also increases the risk of becoming dependent, with heavier drinking associated with a greater risk of dependence. The current state of this risk has not been quantified (Single et al., 1999), and further research is required in order to better understand the progression from non-dependent drinking patterns to dependence (National Health and Medical Research Council, 2000).

English et al.(1995) reported that light to moderate drinking was not associated with increased risk of spontaneous abortion, and extrapolations from animal models have shown that extremely high doses are required to produce spontaneous abortion in animals (Single et al., 1999). A recent study, however, showed an additional 1% increase in risk associated with each additional drink per week after taking into account smoking and other factors (Single et al., 1999). There is consensus that fetal alcohol syndrome (FAS) is not a consequence of light or moderate drinking and it has been estimated that the threshold for FAS is 535g alcohol per week, that is, between 7-8 drinks per day (Single et al., 1999). Alcohol-related birth defects were not found to be associated with drinking pattern of up to 2 drinks per day. English et al.(1995) concluded that there was insufficient evidence of an association between growth retardation and low birthweight and low to moderate drinking, and assigned aetiologic fractions only to hazardous and harmful drinking. However, there is some evidence that moderate drinking (greater than 3 drinks per week in one study, at least 3 drinks per week in another) may have a small effect on birthweight. Nevertheless, in comparison to other risk factors such as smoking these risks are minimal (Single et al., 1999). Since the Australian prevalence of heavy drinking in pregnancy in the general community appears to be very low<sup>1</sup>, the effects of alcohol during pregnancy should probably be assigned a relatively low public health priority. Although Indigenous Australians are less likely than non-Indigenous Australians to be drinkers of alcohol, those Indigenous people who do consume alcohol are more likely to do so at hazardous and harmful levels than are non-Indigenous drinkers (Australian Bureau of Statistics 1995a; Commonwealth Department of Human Services and Health 1996). It is therefore possible that the prevalence of heavy drinking in pregnancy within some Aboriginal and Torres Strait Islander communities may be higher than in the general community, and that the effects of alcohol in pregnancy may be a public health issue in these communities.

While the evidence relating heavy alcohol consumption to neurodevelopmental deficits is apparently clear, the consensus seems to be that there is insufficient evidence of an effect at low to moderate levels to recommend abstinence in pregnancy (Single et al., 1999).

---

<sup>1</sup> Only 18.6% of Australian women report drinking in their pregnancy and all of these women said they did so at low levels (Williams, 1997)

### **Beneficial consequences**

Small to moderate intakes of alcohol appear to confer protection against ischaemic heart disease (English et al., 1995; McElduff & Dobson, 1997; Simons et al., 2000; Single et al., 1999). Low-level alcohol consumption may offer some protection against stroke, primarily by its action on reducing the risk of ischaemic stroke. However, some studies show either no evidence of risk reduction, or a direct risk relationship of stroke with alcohol intake (English et al., 1995; Single et al., 1999). There is evidence that moderate consumption may reduce the risk of diabetes because of alcohol's effect on insulin, and moderate consumption may also be protective against gallstone production (cholelithiasis) (English et al., 1995; Single et al., 1999).

Single et al.(1999) note that there may be a beneficial relationship between alcohol consumption and peripheral vascular disease but that this requires further study. Similarly further research is required on the effect of low levels of alcohol consumption on blood pressure, which currently remains equivocal.

### **Causal and contributory factors**

Whilst a number of studies have identified associations between average total alcohol consumption and overall mortality and specific chronic diseases, it has become apparent that more sophistication and interdisciplinary cooperation is required to elicit subtleties in alcohol research (Bondy, 1996). For example different patterns of alcohol consumption, because of their influence on the underlying biological mechanisms, may affect the progression of different diseases. In cancers of the upper aerodigestive tract the biologically plausible mechanism underlying the condition may be direct contact and mutagenesis of mucosal cells (Single et al., 1999). The results of Jaber et al. 1998 (reported in Single et al., 1999) showed that damage increased with increasing alcohol concentration. This suggests that lower alcohol content drinks and situations where alcohol is consumed with food may buffer effects of carcinogenesis. Again this requires further research.

Another postulated causal mechanism thought to be associated with cancer involves the breakdown of alcohol into circulating acetaldehyde free radicals (breakdown products of alcohol shown to cause cancer in animal models). At present there appears to be little evidence to suggest that there is a lower limit associated with risk, or that specific patterns of drinking are associated with lower risk. Overall cancer mortality appears to have a monotonic association with total alcohol consumption (that is, every extra drink increases the risk of cancer). Further research around cancer and alcohol is required to clarify the role of alcohol and determine whether it is an initiator, promoter or late promoter of disease, and whether there is any evidence of a threshold effect for specific types of cancer, and whether other risk factors in combination with alcohol may have a role (Single et al., 1999). Multi-disciplinary research using animal models, examining biochemical processes, and employing epidemiological methods should be considered.

On the other hand, the anti-atherogenic and anti-haemostatic properties of alcohol provide a biologically plausible mechanism whereby the risk of ischaemic stroke and heart disease is likely to be decreased, with this risk affected markedly by different patterns of consumption. Small to moderate regular intakes of alcohol appear to confer protection against ischaemic heart disease (English et al., 1995; McElduff & Dobson, 1997; Simons et al., 2000; Single et al., 1999) and possibly reduced risk due to an acute coronary event also (McElduff & Dobson, 1997). Little if any additional benefit is obtained from larger amounts (English et al., 1995; McElduff & Dobson, 1997; Simons et al., 2000; Single et al., 1999). The benefit is associated largely, if not wholly, with ethanol per se and not beverage type (Doll, 1998; Single et al., 1999). Protection is most closely associated with a consistent pattern of drinking small amounts (McElduff & Dobson, 1997), and this also supported by biochemical evidence, which finds that the effect of alcohol on the blood is relatively short lived (Single et al., 1999). Variable drinking patterns (binge drinking) may actually increase the risk of ischaemic heart disease and death due to cardiovascular diseases (McElduff & Dobson, 1997). This suggests that further studies of patterns of disease, including the effects of alcohol free days, need to be conducted to determine the extent of regularity in drinking patterns that is required to confer optimum benefit.

Other factors that impact or moderate the relationship between alcohol and chronic diseases include those that are individually and socially determined. Some of these factors will briefly be considered here.

### **Genetic influences**

The breakdown of alcohol into acetaldehyde is influenced by alcohol dehydrogenase of which two forms exist - one of which breaks down alcohol more quickly with the faster enzyme resulting in more rapid development of increased concentrations of acetaldehyde. The presence of these enzymes is individually genetically determined and may influence cancer risk per se (National Institute on Alcohol Abuse and Alcoholism, 2000).

### **Sex**

Women's biological susceptibility to both the acute and chronic effects of alcohol occurs at lower levels of exposure than men's. This is due to women's size, their smaller risk of heart disease compared with men at each age, their greater susceptibility to liver damage, and their higher risk of breast cancer (Doll, 1998). For women, the J or U curve between alcohol exposure and disease still exists but is transposed to the left (Doll, 1998). This has resulted in lower limits being set for each of the different categories of light, moderate and heavy drinking for women (English et al., 1995; Pols & Hawks, 1992; Single et al., 1999).

### **Age**

The majority of studies of chronic disease show that it is in middle age that the health benefits of long-term alcohol use begin to display themselves (Doll, 1998; Single et al., 1999). Is this the cumulative effect of alcohol consumption over years, or due to changes of the body with age that make it more susceptible to alcohol-induced benefits? Amongst young people, and particularly young men, there appears to be no benefit on mortality of alcohol intake (Doll, 1998). In a study of Swedish army recruits followed up over 20 years lower mortality was found amongst abstainers than moderate drinkers, with the highest mortality figures found among heavy drinkers (Andreasson, Romelsjo, & Allebeck, 1991). This is illustrative of the varying effects of alcohol on different groups, particularly those at higher risk of acute incidents compared with long-term harms.

### **Cultural and social determinants**

Australia is a society where it is common to consume alcohol regularly at light to moderate levels, and sporadically at heavy levels in binge drinking patterns (Australian Institute of Health and Welfare, 1999). Cultural and social factors affect drinking patterns and may also lead to different outcomes in groups with similar drinking patterns. In the latter case, a range of influences in the environment may interact with alcohol consumption to affect the development, progression, treatment and outcome of alcohol-related diseases. These influences include personal income (Makela, 1999), social support, and diet. This means that the long-term consequences of alcohol need to be studied using complex designs, as multifactorial causality is likely. Whilst moderating factors are sometimes cursorily included in studies of alcohol and health consequences, there has been little exploration of the complexity of the interactions between moderating factors and alcohol. Further research may elicit links between health outcomes and common drinking patterns in Australian contexts, (for example, carcinogenic barbecued sausages and beer).

## **Long-term psychological consequences of alcohol consumption**

Alcohol consumption is associated with a variety of consequences in the psychological domain. This is particularly the case in relation to cognitive performance and psychosocial functioning, with a considerable research effort emerging in relation to the co-occurrence of problematic alcohol use and mental disorders such as depression (Blanchard, 2000).

### **The long-term consequences of alcohol consumption on cognitive performance**

It has been widely demonstrated that acute doses of alcohol can impair cognition across a variety of domains including memory, language, attention and perception. Chronic alcohol 'abuse' (while

generally poorly defined) can produce a range of cognitive impairments with deficits evident in tests of perceptual-motor skill and visual-spatial functioning, tasks involving memory and learning, as well as other cognitive tasks such as those involving abstraction and problem solving (Parsons & Nixon, 1993). These deficits are especially pronounced in cases of Wernicke-Korsakoff syndrome which is an alcohol-related condition, now relatively rare in Australia, typically characterised by poor ability to retain new information (that is, episodic memory is affected). More automatic information processing abilities, such as procedural or implicit memory, remain largely intact (Parsons & Nixon, 1993). However, it should be noted that there is considerable variation in the reported effects found for other types of heavy drinkers, with some studies showing no differences in cognitive performance between 'chronic alcoholics' and 'normal' controls (Krabbendam et al., 2000; Parsons, 1994).

There are also some studies that show that long-term alcohol consumption can produce subsequent cognitive impairment for other groups of heavy drinkers (typically consuming at what would be defined as harmful or above using Australian definitions) when sober (Parsons & Nixon, 1998), with some of these effects mirroring those of acute doses of alcohol (Dennis, 1993). There is limited evidence of a dose-response effect for such cognitive impairment across a continuum with impairment greatest for those consuming alcohol at the highest levels (eg Wernicke-Korsakoff patients) (Parsons & Nixon, 1998). An Australian study found impairment evident for Australian heavy drinkers who consume alcohol on a daily rather than a more sporadic (binge) basis (Kokavec & Crowe, 1999). There is, however, little evidence to show that moderate social drinking (generally defined as below harmful levels) produces permanent cognitive impairment in studies using Australian (Bowden, Walton, & Walsh, 1988), or other, subjects (Bowden, 1987; Parsons & Nixon, 1998). Further, there is sufficient variation in the results of studies for heavy social drinkers to suggest the need for further research (Parsons & Nixon, 1998).

There is evidence that the effects of alcohol consumption on cognition differ as a function of a variety of factors such as age and sex (Mumenthaler, Taylor, O'Hara, & Yesavage, 1999). These probably reflect actual differences in the biochemical/physiological mechanisms by which alcohol exerts its overall effects, as previously discussed.

### **The long-term consequences of alcohol consumption on mental health**

Recent analysis of the National Survey of Mental Health and Well-Being shows that alcohol dependence is the most widely prevalent substance use disorder in Australia, with 6.5% of the surveyed population meeting criteria for an alcohol use disorder (3.0% harmful use and 3.5% dependence) within the 12 months prior to the survey (Hall, Teeson, Lynskey, & Degenhardt, 1999). While alcohol dependence is characterised by a range of psychological consequences producing generally poor conditions of mental health (Degenhardt, Hall, Teeson, & Lynskey, 2000), it is the association between heavy long-term alcohol consumption (usually characterised by dependence) with both affective (Lynskey, 1998) and other mental disorders (Blanchard, 2000) that is the subject of an emerging research effort both in Australia and overseas.

A range of mental health conditions have been associated with chronic alcohol dependence and/or abuse including anxiety disorders (Degenhardt et al., 2000; Kushner, Abrams, & Borchardt, 2000), affective disorders such as depression (Degenhardt et al., 2000; Lynskey, 1998; Swendsen & Merikangas, 2000) and bipolar disorders (Strakowski & DelBello, 2000), borderline personality disorder (Trull, Sher, Minks-Brown, Durbin, & Burr, 2000), antisocial behaviours (Waldman & Slutske, 2000) and psychoses such as schizophrenia (Blanchard, Brown, Horan, & Sherwood, 2000). In the USA, the Epidemiological Catchment Area studies have shown the prevalence of comorbidity between alcohol use and a range of mental health conditions (Reiger et al., 1990). Recent Australian research using the National Survey of Mental Health and Well-Being shows that 24% of those screening positively for psychosis show a comorbid alcohol use disorder with alcohol dependence a significant predictor of the number of psychotic symptoms reported (Degenhardt & Hall, 2000). Similarly, analyses of this survey also show that a significant proportion of those meeting the criteria for alcohol dependence suffer from comorbid affective (24%) and anxiety disorders (20%) (Degenhardt et al., 2000).

### **Causal and contributory factors**

While there is information on the prevalence of comorbid alcohol use and mental health disorders, the aetiology of this comorbidity is poorly understood. As indicated by Lynskey (1998, adapted from Caron & Rutter, 1991), explanations of the comorbidity generally occur within four broad classes: “(a) that one condition increases the risk for the other condition; (b) the conditions may be comorbid because they share the same risk factors; (c) the risk factors for the two conditions may be separate and distinct but nonetheless correlated, and it is this correlation between the risk factors that causes the conditions to be comorbid; and (d) the conditions may be correlated or comorbid because they are reflections of a common syndrome or vulnerability.” (p. 202). Variations of this taxonomy of explanations of comorbidity have been used to consider the aetiology of all of the mental health conditions that co-occur with alcohol use disorders (Blanchard et al., 2000; Kushner et al., 2000; Lynskey, 1998; Strakowski & DelBello, 2000; Swendsen & Merikangas, 2000; Trull et al., 2000; Waldman & Slutske, 2000) with recent work focusing on genetic vulnerabilities (Lynskey, 1998; Waldman & Slutske, 2000, class ‘d’ above). In spite of the importance of understanding these causal mechanisms for treatment (Lynskey, 1998), there is as yet no conclusive evidence of the causal mechanisms involved in the comorbidity observed between alcohol use disorders and most of the mental health conditions listed above. Nevertheless, while further research is required, there is reasonable evidence to suggest a two-way relationship whereby heavy alcohol use can exacerbate mood disorders, and persons with mood disorders appear predisposed to heavy alcohol use (Kushner et al., 2000) with similar models proposed in relation to phobias (Stockwell & Bolderston, 1987).

There are possible positive effects of moderate alcohol use on mental health. Alcohol use can reduce stress (Sayette, 1999) and social phobia (Fones, Manfro, & Pollack, 1998), and the prevalence of a variety of mental health disorders is less common amongst moderate, non-problematic, drinkers than either abstainers or heavy drinkers (Degenhardt et al., 2000). Further, the potential role of alcohol in self-medication of mental health disorders (explanation ‘a’ above) may present as a significant mental health treatment benefit. Alternatively, alcohol consumption may actually cause mental health disorders. Again, however, as the aetiology of these effects is poorly understood, the extent to which alcohol use should be seen as harmful or beneficial to mental health is unclear. For example, the effects of alcohol on stress and anxiety have been posited to be part of a feed-forward mechanism responsible for the production of anxiety disorders (Kushner et al., 2000). Furthermore, it is unlikely that the positive effects of moderate drinking compared to abstinence on mental health derive directly from the effects of alcohol.

While the aetiological role of long-term alcohol consumption in mental health disorders is unclear, there is sufficient evidence of its role in at least some mental health conditions to satisfy the definition of ‘causation’ used in English et al.’s (1995) meta-analysis of the biomedical consequences of alcohol consumption (see, for example, their inclusion of suicide as a partially alcohol-caused condition). The absence of a consideration of the role of alcohol consumption in mental health may significantly under- or over-estimate the effects of alcohol consumption on mortality and morbidity (Chikritzhs et al., 2000; English et al., 1995) and the overall burden of disease in the community (Victorian Department of Human Services, 1999).

### **Social consequences of long-term alcohol consumption**

Kreitman (1986) has suggested that there are three broad areas of social functioning in which the consequences of long-term alcohol consumption should be considered:

- effects on relationships;
- effects on work; and
- effects on ‘public order’.

This section reviews the research on the effects on long-term alcohol consumption on relationships and work. It should be noted that there is a paucity of research in these areas, and the research uses widely differing definitions of problem drinking/alcohol abuse. The research on the effects on ‘public order’

has generally been considered in relation to single bouts of intoxication and is examined in other papers in this series.

### **Effects on relationships**

Most researchers acknowledge that living with an excessive drinker is stressful. Clinical and empirical studies have demonstrated that families with alcoholic members are often beset by difficulties in functioning effectively. Several areas of impaired functioning in the families of alcoholics have been identified. These families can have difficulty in reaching effective solutions to family problems. The communication process is often impaired, role functions are often disrupted or grossly skewed, and family members may have difficulty in establishing standards of appropriate behaviour (McKay, Longabaugh, Beattie, Maisto, & Noel, 1992).

It appears that there is a 'marriage effect' with respect to drinking and drinking problems. This effect is characterised by less consumption and fewer problems among married men and women as compared with either single or divorced individuals (Leonard & Rothbard, 1999). In reviewing the evidence regarding processes that might account for the marriage effect Leonard & Rothbard (1999) found that the marriage effect reflects three processes: (1) reduced alcohol consumption triggered by the transition to marriage, (2) the deleterious effect of heavy drinking on marital quality and marital stability, and (3) increased consumption in response to the transition to divorce.

Women are probably more affected by other people's problem drinking than men, both because more problem drinkers are men and also because women are more likely to feel affected because of societal expectations of women's 'caring' role (Zajdow, 1995). A Finnish study showed that although similar proportions of men and women reported that one or more people close to them were drinking 'too much', women were twice as likely as men to report that their lives had been affected by the other person's drinking (Holmila, 1994).

The research on partners of heavy drinkers has largely focused on female partners of male drinkers. Watts et al. (1994) noted that two main questions have dominated this literature, namely, why do they marry problem drinkers? and, why do they stay married to them? Early explanations sought answers to these questions in the personality characteristics of spouses, arguing that wives of male drinkers had disturbed personalities that influenced their husband's drinking. In the 1980s and 1990s two contrasting views emerged, with the co-dependency model again emphasising individual pathology in wives, while the stress and coping model emphasises the active problem-solving that wives use to manage drinking in their partners (Hurcom, Copello, & Orford, 2000).

Watts et al. (1994) found that research had generally emphasised outcomes for the drinker, with less focus on the quality of life of the non-drinking spouse or relative. There is, therefore, little research evidence on the extent to which spouses are affected by their partners' problem drinking, although one small study found that women's paid work was adversely affected by their husbands' problem drinking (Casey, Griffin, & Googins, 1993).

There does not seem to be any recent Australian research investigating this issue, or attempting to estimate the magnitude of the effect of problem drinking on spouses' health or quality of life.

In a review of the literature on children of problem drinkers, Hurcom et al. (2000) concluded that while there is ample evidence that alcohol is associated with distress and negative effects, it is not clear to what extent these effects are caused by alcohol. Research in this area has often been characterised by lack of control groups, small samples and sampling bias, and co-existing parental pathology (for example, mental illness) has often been ignored. Evidence about the long-term effect on children is inconclusive, with some studies showing no effect on adult children of problem drinkers, and others showing that for some children there were positive effects, such as development of responsibility and decision-making skills. Most research in this area has focused on the effects of problem-drinking fathers on their male offspring (Velleman, 1992).

## Effects on work

The effects of acute episodes of drinking on paid work (eg accidents at work, absenteeism due to hangovers, reduced productivity) are covered in the Stockwell paper. This section considers more long-term effects related to paid work. For this section of the paper, the economic research database EconLit was searched in addition to the other databases mentioned in the introduction. Given the potential importance of this issue, there is remarkably little published research on the topic and no clear conclusions emerge.

Although some studies have found that high alcohol consumption increases the likelihood of unemployment (Leino-Arjas, Liira, Mutanen, Malmivaara, & Matikainen, 1999; Mullahy & Sindelar, 1996), other studies have found no association between levels of alcohol consumption and subsequent rates of unemployment (Lahelma, Kangas, & Manderbacka, 1995; Rehm & Gmel, 1999). Similarly there is evidence both for (Claussen, 1999; Montgomery, Cook, Bartley, & Wadsworth, 1998) and against (Leino-Arjas et al., 1999; Morrell, Taylor, & Kerr, 1998) the hypothesis that unemployment leads to alcohol problems.

There do not appear to be any Australian studies on this topic. Given the differences between labour markets in different countries and the changing nature of the Australian labour market in recent years, it is by no means clear that the results of research carried out overseas would be relevant to current Australian conditions.

## Monitoring the long-term consequences of alcohol consumption

Whilst it is important to determine novel links and clarify associations between alcohol and its long-term biomedical consequences, it is also important that current alcohol-related conditions are monitored. Monitoring of the consequences of the long-term use of alcohol is important for appropriate policymaking and program planning and ultimately also feeds back into research development.

In Australia the consequences of long term alcohol use are measured at a national level in part by the National Drug Strategy Household (Australian Institute of Health and Welfare, 1999; Department of Health and Family Services, 1996), National Health (Australian Bureau of Statistics, 1995; Castles, 1992; Donath, 1999) and Secondary School Student (Hill, White, & Letcher, 1998) Surveys along with a variety of state-based surveys. In general the surveys focus on patterns of alcohol use rather than alcohol-related consequences, and the self-report questions on alcohol-related problems included tend to relate to incidents associated with intoxication (Australian Institute of Health and Welfare, 1999). Personal health items also form part of the questionnaire although it appears secondary analyses of these items and self-reported alcohol-related incident items with patterns of alcohol use have not been published. Improvements in these surveys (eg more comprehensive assessments of general health status and use of treatment services such as GPs) may allow the use of these surveys in a closer examination of the relationships between regular patterns of alcohol use and long-term consequences. It is crucial that sample sizes are carefully determined to enable research questions such as these to be examined carefully.

Indicator studies have been undertaken in relation to the National Drug Strategy (Williams, 1997) and more recently through the National Alcohol Indicators Project (Chikritzhs, Jonas et al., 1999; Chikritzhs et al., 2000; Chikritzhs, Stockwell et al., 1999) along with state-based research (Dietze et al., in press; The Measurement of Alcohol Problems for Policy Project, 1995). These studies use few indicators of the long-term consequences of alcohol consumption apart from mortality as expressed in deaths and the percentage years of life lost (PYLL), and morbidity as measured by hospitalisations and bed-days. These indicators are largely dependent on existing databases and do not as yet include the full range of alcohol-related harm, for example mental health and other social measures such as domestic violence, reflecting the biomedical orientation of much of the work undertaken. While these indicator studies appear to show that much of the morbidity attributed to alcohol consumption derives

from acute bouts of intoxication (see Stockwell's paper), current data does not estimate the extent to which these may be caused by long-term problem drinkers because analyses are case-, rather than person-, based.

## Conclusions

The review of the literature undertaken for this paper clearly specifies some of the major long-term biochemical/physiological, psychological and social consequences (both beneficial or harmful) of long-term alcohol consumption. The review is by no means a comprehensive examination of the literature in this area and has not considered the long term consequences of alcohol consumption within specific sub-populations, such as people from different cultural and linguistic backgrounds, in any great detail. Nevertheless, it has clearly identified a variety of areas that warrant further research.

In this paper we have concluded that the majority of research on the long-term consequences of alcohol consumption is biomedically oriented. Population-based research in the area reflects this orientation, with the majority of studies considering long-term alcohol consumption largely in relation to its biomedical, rather than social or psychosocial, consequences (eg Chikritzhs et al., 2000; English et al., 1995). While this apparent neglect is of concern, it presents an opportunity for Australian researchers to make a considerable contribution to international research in this area. Such a contribution will require innovative research using a variety of qualitative and quantitative methods (see, for example, Hands, Banwell, & Hamilton, 1995, for recommendations in this area). Improved understandings of the causal role of alcohol consumption (both long-term and acute) in mental health and other social conditions will allow for the generation of a more complete picture of the overall burden of alcohol consumption to the Australian community. Importantly, such a picture will allow for the examination of the consequences of long-term alcohol use both as a function of the amount consumed, as well as the differing domains upon which alcohol consumption has an effect. In this regard, harmful consequences in one domain (eg biochemical/physiological processes) may be offset by benefits in another (eg mental health).

Recent Australian research on alcohol consumption has concentrated largely on the consequences of acute drinking (see the preponderance of literature on intoxication, accidents and injuries), which probably reflects the current specification of alcohol-related harm within the public health model that identifies the bulk of harm as originating from episodes of intoxication as measured in the number of deaths, years of life lost, hospitalisations and bed-days (Chikritzhs, Jonas et al., 1999). However, alcohol dependence is responsible for more bed-day stays and (arguably) hospital costs than any other single alcohol-related condition (Chikritzhs, Jonas et al., 1999), and Canadian work suggests that 50% of the total costs of alcohol consumption can be attributed to people who could be classified as alcohol dependent (Single et al., 1999). Moreover, there is evidence that heavy drinkers and light-to-moderate drinkers contribute equally to the prevalence of the harms typically conceptualised as resulting from episodes of intoxication, and interventions for problematic drinking can reduce the occurrence of these harms (Dinh-Zarr, Diguseppi, Heitman, & Roberts, 1999; Norstrom, 1995). Clearly, further research is required in order to properly disentangle the relative contributions of different patterns of drinking to a variety of alcohol-related consequences in Australia.

While the gaps in existing research identified suggest research priorities outside of the strictly biomedical domain, there remains the possibility for a considerable research effort in this domain. For example, long-term sporadic binge drinking may have consequences such as coronary death (McElduff & Dobson, 1997) and acute myocardial infarction (Kauhanen, Kaplan, Goldberg, & Salonen, 1997), both of which have been documented amongst regular binge drinkers. Similarly, questions remain about the degree of regularity required in drinking to achieve the beneficial effects associated with moderate levels of alcohol consumption, for example, do regular alcohol free days affect the incidence of disease?

## Recommendations for future research

In this paper we have broadly outlined the domains of research that require attention in relation to the long-term consequences of alcohol consumption. In illustrating these domains we have avoided providing detailed specifications of individual projects - rather we have endeavoured to provide a framework from which we believe experts from a variety of domains will be able to develop innovative projects to answer some of the more pressing questions regarding the long term consequences of alcohol use. In general terms we suggest that research is required that:

- examines the causal role of alcohol consumption (both long-term and acute) in mental health and other social conditions to provide a more complete picture of the overall burden of alcohol consumption to the Australian community in order to better target prevention and treatment initiatives;
- examines the consequences (measuring both harm and benefit) of long-term alcohol use both as a function of the amount consumed, as well as the differing domains (biomedical, physiological, mental health) upon which alcohol consumption has an effect; and
- disentangles the relative contributions of different patterns of drinking to a variety of alcohol-related consequences in Australia.

## References

- Andreasson, S., Romelsjo, A., & Allebeck, P. (1991). Alcohol, social factors and mortality among young men. *British Journal of Addiction*, 86, 877-887.
- Australian Bureau of Statistics. (1995). *National health survey: Summary results Australian states and territories (Cat no. 4368.0)*. Canberra, Australia: Australian Bureau of Statistics.
- Australian Bureau of Statistics. (1995a). *National Health Survey: Aboriginal and Torres Strait Islander Results (Cat. no. 4806.0)*. Canberra, Australia: Australian Bureau of Statistics.
- Australian Institute of Health and Welfare. (1999). *1998 National Drug Strategy Household Survey: First Results*. Canberra, Australia.
- Blanchard, J. J. (2000). The co-occurrence of substance use in other mental disorders: Editor's introduction. *Clinical Psychology Review*, 20(2), 145-148.
- Blanchard, J. J., Brown, S. A., Horan, W. P., & Sherwood, A. R. (2000). Substance use disorders in schizophrenia: Review, integration and a proposed model. *Clinical Psychology Review*, 20(2), 207-234.
- Bondy, S. J. (1996). Overview of drinking patterns and consequences. *Addiction*, 91(11), 1663-1674.
- Bowden, S. C. (1987). Brain impairment in social drinkers? No cause for concern. *Alcoholism: Clinical and experimental Research*, 11, 407-410.
- Bowden, S. C., Walton, N. H., & Walsh, K. (1988). The hangover hypothesis and the influence of moderate social drinking on mental ability. *Alcoholism: Clinical and experimental Research*, 12, 25-29.
- Casey, J. C., Griffin, M. L., & Googins, B. K. (1993). The role of work for wives of alcoholics. *American Journal of Drug and Alcohol Abuse*, 19(1), 119-131.
- Castles, I. (1992). *1989-90 National health survey: Health risk factors, Victoria.*: Australian Bureau of Statistics.
- Chikritzhs, T., Jonas, H., Heale, P., Dietze, P., Hanlin, K., & Stockwell, T. (1999). *Alcohol-Caused Deaths and Hospitalisations in Australia, 1990-1997* (National Alcohol Indicators Project, Bulletin No 1). Perth: National Drug Research Institute.
- Chikritzhs, T., Jonas, H., Heale, P., Stockwell, T., Dietze, P., Hanlin, K., & Webb, M. (2000). *Alcohol-Caused Deaths and Hospitalisations in Australia, 1990-1997: National Alcohol Indicators Technical Report No 1* (National Alcohol Indicators Project, Bulletin No 1). Perth: National Drug Research Institute.

- Chikritzhs, T., Stockwell, T., Hendrie, D., Ying, F., Fordham, R., & Cronin, J. (1999). *The Public Health and Safety Benefits of the Northern Territory's Living With Alcohol Program 1992/3 to 1995/6: National Drug Research Institute Monograph No 2* (National Alcohol Indicators Project, Bulletin No 1). Perth: National Drug Research Institute.
- Claussen, B. (1999). Alcohol disorders and re-employment in a 5-year follow-up of long-term unemployed. *Addiction*, *94*(1), 133-138.
- Commonwealth Department of Human Services and Health. (1996). *National Drug Strategy Household Survey: Urban Aboriginal and Torres Strait Islander Peoples Supplement, 1994*. Canberra, Australia: DHFS.
- Corrao, G., Bagnardi, V., Zambon, A., & Arico, S. (1999). Exploring the dose-response relationship between alcohol consumption and the risk of several alcohol-related conditions: a meta-analysis. *Addiction*, *94*(10), 1551-1573.
- Degenhardt, L., & Hall, W. (2000). *The association between psychosis and problematic drug use among Australian adults: Findings from the National Survey of Mental Health and Well-Being (NDARC Technical Report No 93)*. Sydney: National Drug and Alcohol Research Centre.
- Degenhardt, L., Hall, W., Teeson, M., & Lynskey, M. (2000). *Alcohol Use Disorders in Australia: Findings from the National Survey of Mental Health and Well-Being (NDARC Technical Report No 97)*. Sydney: National Drug and Alcohol Research Centre.
- Dennis, M. E. (1993). Chronic alcohol abuse effects on driving task abilities. *Journal of Alcohol and Drug Education*, *39*(1), 107-110.
- Department of Health and Family Services. (1996). *National Drug Strategy Household Survey: Survey Report 1995*. Canberra, Australia: Australian Government Publishing Service.
- Dietze, P., Rumbold, G., Cvetkovski, S., Hanlin, K., Laslett, A.-M., & Jonas, H. (in press). Using population-based data on alcohol consumption and related harms to estimate the relative need for alcohol services in Victoria, Australia. *Evaluation and Program Planning*.
- Dinh-Zarr, T., Diguseppi, C., Heitman, E., & Roberts, I. (1999). Preventing injuries through interventions for problem drinking: A systematic review of randomised controlled trials. *Alcohol and Alcoholism*, *34*(4), 609-621.
- Doll, R. (1998). The benefit of alcohol in moderation. *Drug and Alcohol Review*, *17*, 353-363.
- Doll, R., Pet, R., Hall, E., Wheatley, K., & Gray, R. (1994). Mortality in relation to consumption of alcohol: 13 years' observations on male British doctors. *British Medical Journal*, *309*, 911-918.
- Donath, S. (1999). Estimated alcohol consumption in the 1995 National Health Survey: Some methodological issues. *Australian and New Zealand Journal of Public Health*, *23*(2), 131-135.
- English, D. R., Holman, C. D. J., Milne, E., Winter, M. G., Hulse, G. K., Codde, J. P., Bower, C. I., Corti, B., de Klerk, N., Knuiman, M. W., Kurinczuk, J. J., Lewin, G. F., & Ryan, G. A. (1995). *The Quantification of Drug Caused Morbidity and Mortality in Australia, 1995 Edition* (Vol. 1). Canberra: Australian Government Publishing Service.
- Fones, C. S. L., Manfro, G. G., & Pollack, M. H. (1998). Social phobia: An update. *Harvard-Review-of-Psychiatry*, *5*(5), 247-259.
- Hall, W., Teeson, M., Lynskey, M., & Degenhardt, L. (1999). The 12-month prevalence of substance use and ICD10 substance use disorders in Australian adults: Findings from the National Survey of Mental Health and Well-Being. *Addiction*, *94*, 1541-1550.
- Hands, M. A., Banwell, C. L., & Hamilton, M. A. (1995). Women and alcohol: Current Australian research. *Drug and Alcohol Review*, *14*(1), 17-25.
- Heale, P., Stockwell, T., Dietze, P., & Chikritzhs, T. (in preparation). *Alcohol consumption in Australia above low risk limits for health: National Alcohol Indicators Project, Bulletin No 4*, Perth: National Drug Research Institute.

- Her, M., & Rehm, J. (1998). Alcohol and all-cause mortality in Europe 1982-1990: a pooled cross-section time-series analysis. *Addiction*, *93*(9), 1335-1440.
- Hill, D., White, V., & Letcher, T. (1998). *Prevalence of smoking behaviours amongst Victorian secondary school students in 1996*. Melbourne: Centre for Behavioural Research in Cancer, Anti-Cancer Council of Victoria.
- Holman, C. D. J., Armstrong, B. K., Arias, L. N., Martin, C. A., Hatton, W. M., Hayward, L. D., Salmon, M. A., Shean, R. E., & Waddell, V. P. (1990). *The quantification of drug caused morbidity and mortality in Australia in 1988, Parts 1 and 2*. Canberra, Australia: Commonwealth Department of Health, Housing, Local Government and Community Services.
- Holmila, M. (1994). Excessive drinking and significant others. *Drug and Alcohol Review*, *13*(4), 431-436.
- Hurcom, C., Copello, A., & Orford, J. (2000). The family and alcohol: Effects of excessive drinking and conceptualizations of spouses over recent decades. *Substance Use and Misuse*, *35*(4), 473-502.
- Kauhanen, J., Kaplan, G. A., Goldberg, D. E., & Salonen, J. T. (1997). Beer bingeing and mortality: results from Kuopio ischaemic heart disease risk factor study, a prospective population based study. *British Medical Journal*, *315*, 846-851.
- Kokavec, A., & Crowe, S. F. (1999). A comparison of cognitive performance in binge versus regular chronic alcohol misusers. *Alcohol and Alcoholism*, *34*(4), 601-608.
- Krabbendam, L., Visser, P. J., Derix, M. M., Verhey, F., Hofman, P., Verhoeven, W., Tuinier, S., & Jolles, J. (2000). Normal cognitive performance in patients with chronic alcoholism in contrast to patients with Korsakoff's syndrome. *Journal of Neuropsychiatry and Clinical Neurosciences*, *12*(1), 44-50.
- Kreitman, N. (1986). Alcohol consumption and the preventive paradox. *British Journal of Addiction*, *81*, 353-363.
- Kushner, M. G., Abrams, K., & Borchardt, C. (2000). The relationship between anxiety disorders and alcohol use disorders: A review of major perspectives and findings. *Clinical Psychology Review*, *20*(2), 149-171.
- Lahelma, E., Kangas, R., & Manderbacka, K. (1995). Drinking and unemployment - contrasting patterns among men and women. *Drug & Alcohol Dependence*, *37*(1), 71-82.
- Leino-Arjas, P., Liira, J., Mutanen, P., Malmivaara, A., & Matikainen, E. (1999). Predictors and consequences of unemployment among construction workers: prospective cohort study. *British Medical Journal*, *319*(7210), 600-605.
- Leonard, K. E., & Rothbard, J. C. (1999). Alcohol and the marriage effect. *Journal of Studies on Alcohol*, *13*, 139-146.
- Lynskey, M. (1998). The comorbidity of alcohol dependence and affective disorders: Treatment implications. *Drug and Alcohol Dependence*, *52*, 201-209.
- Makela, P. (1999). Alcohol-related mortality as a function of socio-economic status. *Addiction*, *94*(6), 867-886.
- McElduff, P., & Dobson, A. J. (1997). How much alcohol and how often? Population based case-control study of alcohol consumption and risk of major coronary event. *British Medical Journal*, *314*, 1159-1164.
- McKay, J. R., Longabaugh, R., Beattie, M. C., Maisto, S. A., & Noel, N. E. (1992). The relationship of pretreatment family functioning to drinking behavior during follow-up by alcoholic parents. *American Journal of Drug and Alcohol Abuse*, *18*(4), 445-460.
- Montgomery, S. M., Cook, D. G., Bartley, M. J., & Wadsworth, M. E. J. (1998). Unemployment, cigarette smoking, alcohol consumption and body weight in young British men. *European Journal of Public Health*, *8*(1), 21-27.
- Morrell, S. L., Taylor, R. J., & Kerr, C. B. (1998). Jobless - unemployment and young people's health. *Medical Journal of Australia*, *168*(5), 236-240.

- Mullahy, J., & Sindelar, J. (1996). Employment, unemployment, and problem drinking. *Journal of Health Economics*, 15(4), 409-434.
- Mumenthaler, M. S., Taylor, J. L., O'Hara, R., & Yesavage, J. A. (1999). Gender differences in moderate drinking effects. *Alcohol Research and Health*, 23(1), 55.
- National Health and Medical Research Council. (2000). *Australian Drinking Guidelines : Consultation Draft*. Canberra: National Health and Medical Research Council.
- National Institute on Alcohol Abuse and Alcoholism. (2000). *The 10th Report to US Congress on Alcohol and Health*. Maryland: National Institute Health
- Norstrom, T. (1995). Prevention strategies and alcohol policy. *Addiction*, 90, 515-524.
- Parsons, O. A. (1994). Neuropsychological measures and event-related potentials in alcoholics: interrelationships, long-term reliabilities, and prediction of resumption of drinking. *Journal of Clinical Psychology*, 50(1), 37-46.
- Parsons, O. A., & Nixon, S. J. (1993). Neurobehavioral sequelae of alcoholism. *Neurologic Clinics*, 11(1), 205-218.
- Parsons, O. A., & Nixon, S. J. (1998). Cognitive functioning in sober social drinkers: A review of the research since 1996. *Journal of Studies on Alcohol*, 59, 180-190.
- Pols, R. E., & Hawks, D. (1992). *Is There a Safe Level of Daily Consumption of Alcohol for Men and Women? Recommendations Regarding Responsible Drinking Behaviour* ( 2nd ed.). Canberra: Australian Government Publishing Service.
- Pols, R. G., & Hawks, D. V. (1992). *Is there a safe level of daily consumption of alcohol for men and women?* ( 2nd ed.). Canberra: Australian Government Publishing Service.
- Rankin, J., Halliday, M. I., Corey, P. N. J., Coates, R. A., & de Lint, J. E. (1985). Epidemiology of liver disease I: Australia. In P. Hall & E. Arnold (Eds.), *Alcoholic liver disease* (pp. 115-129). London.
- Rehm, J., & Fischer, B. (1997). Measuring harm: Implications for alcohol epidemiology. In S. E. a. S. T. Plant M. (Ed.), *Alcohol: Minimising the harm. What works?* (pp. 248-261). London: Free Association Books.
- Rehm, J., & Gmel, G. (1999). Patterns of alcohol consumption and social consequences. Results from an 8-year follow-up study in Switzerland. *Addiction*, 94(6), 899-912.
- Reiger, D. A., Farmer, M. E., Rae, D. S., Locke, B. Z., Keith, S. J., Judd, L. L., & Goodwin, F. K. (1990). Comorbidity of mental disorders with alcohol and other drug abuse: Results from the Epidemiological Catchment Area (ECA) study. *Journal of the American Medical Association*, 264, 2511-2518.
- Sayette, M. A. (1999). Does drinking reduce stress? *Alcohol Research and Health*, 23(4), 250-255.
- Simons, L. A., McCallum, J., Friedlander, Y., & Ortiz, M. (2000). Moderate alcohol intake is associated with survival in the elderly: the Dubbo Study. *Medical Journal of Australia*, 172, 121-124.
- Single, E., Ashley, M. J., Bondy, S., Dobbins, M., Rankin, J., & Rehm, J. (1999). *Evidence Regarding the Level of Alcohol Consumption Considered to be Low-Risk for Men and Women*. Canberra: Commonwealth Department of Health and Aged Care.
- Stockwell, T., & Boldertson, H. (1987). Alcohol and phobias. *British Journal of Addiction*, 82, 971-979.
- Strakowski, S. M., & DelBello, M. P. (2000). The co-occurrence of bipolar and substance use disorders. *Clinical Psychology Review*, 20(2), 191-206.
- Swendsen, J. D., & Merikangas, K. R. (2000). The comorbidity of depression and substance use disorders. *Clinical Psychology Review*, 20(2), 173-189.

The Measurement of Alcohol Problems for Policy Project. (1995). *The measurement of alcohol problems for policy (MAPP): A first report of research in progress* (Research Report No. 1). Bentley, WA: National Centre for Research into the Prevention of Drug Abuse, Curtin University.

Trull, T. J., Sher, K. J., Minks-Brown, C., Durbin, J., & Burr, R. (2000). Borderline personality disorder and substance use disorders: A review and integration. *Clinical Psychology Review, 20*(2), 235-253.

Velleman, R. (1992). Intergenerational effects - a review of environmentally oriented studies concerning the relationship between parental alcohol problems and family disharmony in the genesis of alcohol and other problems. 1: The intergenerational effects of alcohol problems. *The International Journal of the Addictions, 27*(3), 253-280.

Victorian Department of Human Services. (1999). *Victorian burden of disease study: Mortality*. Melbourne: Author.

Waldman, N., & Slutske, W. S. (2000). Antisocial behavior and alcoholism: A behavioral genetic perspective on comorbidity. *Clinical Psychology Review, 20*(2), 255-287.

Watts, S., Bush, R., & Wilson, P. (1994). Partners of problem drinkers: moving into the 1990s. *Drug and Alcohol Review, 13*(4).

Williams, P. (1997). *Progress of the National Drug Strategy: Key National Indicators. Evaluation of the National Drug Strategy 1993-1997 Statistical Supplement*. Canberra: Department of Health and Family Services.

Zajdow, G. (1995). Caring and nurturing in the lives of women married to alcoholics. *Women's Studies International Forum, 18*(5-6), 533-546.

## Prevention of alcohol-related harm: Public policy and health

Ann M Roche, National Centre for Education and Training on Addiction, Flinders University of South Australia

Tim Stockwell, National Drug Research Institute, Curtin University of Technology

### The role of evidence and alcohol research

It is increasingly recognised that alcohol consumption plays an important, if complex, role in overall health and wellbeing of individuals and communities. It has been argued that alcohol should be regulated differently from liquid beverages such as milk or orange juice (Solomon, 1994). Solomon holds that “unfortunately, alcohol is not a beverage like all others and it is folly to regulate it as if it were”. A sound evidence base is required to determine the policies required to maximise alcohol’s benefits and minimise its harms. Alcohol research can play an important role in policy development and decision-making. Science by itself, however, is rarely the sole basis for policy decisions. A mix of economic, ethical, and political factors also are involved in alcohol policy development. Whether alcohol policies result from science alone or a mix of other factors, it is important that their outcome be subjected to scientific scrutiny. By doing so, we can determine where policies are successful in achieving a desired outcome and warrant replication, where modifications may be needed to improve the success of a policy, or where policies should be discarded.

### Theoretical underpinnings of alcohol research and policy

The theoretical underpinnings of much alcohol research and policy analysis in developed countries over the past two to three decades has drawn heavily from the “availability theory” of alcohol consumption. This theory in essence holds that:

- increased availability results in increased consumption and that
- increased consumption results in increased alcohol-related problems.

The corollary of this position is that to reduce alcohol-related problems in a community control policies are required which reduce access to and consumption of alcohol. This orientation towards alcohol, has driven alcohol control policies and most prevention strategies for the last several decades, although there are now alternative models which question the utility of the availability model. The last decade has also seen major international changes in terms of government policies on alcohol. Strictures over availability have tended to be substantially lessened and the 1990’s have seen a global expansion of alcohol’s availability. While availability is but one of a complex array of influences on drinking behaviour it can have a powerful impact on harm.

While increased availability does not inevitably lead to increased use or harm, there is nonetheless substantial evidence that increased consumption may have an impact on public health, all other considerations being held constant. It is not clear whether, and under what circumstances, consumption could increase such that only low risk drinking patterns emerged and where there was no increase in risky or high risk drinking. This remains hypothetically possible, but as yet an untested proposition.

Underlying contemporary public policy is a broad view of alcohol-related problems. Alcohol problems are now described by most countries, and the World Health Organization (WHO), as public health concerns. The mid-1970s saw major shift in focus away from an exclusive orientation toward the problems of the relatively few alcohol dependent individuals towards an emphasis and concern for the population overall. Kettel Bruun et al.’s (1975) seminal work in the mid-seventies marked a significant

change in thinking from that which had preceded it for several decades. Previously, emphasis had been placed on the alcoholic and the need to provide treatment services. In contrast, Bruun and colleagues maintained that “changes in the overall consumption of alcoholic beverages have a bearing on the health of the people in any society.” Further, they argued that “Alcohol control measures can be used to limit consumption: thus, control of alcohol availability becomes a public health issue” (Bruun et al., 1975, p.90). Perception of the alcohol environment as an important contributor to alcohol-related problems and of public policies as effective prevention strategies was also seen to fit well with the public health model (Mosher and Jernigan, 1989; Ashley and Rankin, 1984; Room, 1984; Bennett et al., 1992).

## Conceptual issues and changing agendas

In examining alcohol prevention strategies, and the associated research questions, in the context of public policy a number of relevant issues need to be addressed at the outset. These include acknowledgment of underlying conceptual and philosophical differences that characterise this area. There are strongly held views about the role of alcohol in society and the appropriate level of intervention that should be applied by agents such as government and health authorities. These views have shaped and influenced research agendas and public policy positions in many countries. Reviewing the literature and shaping a future research agenda is not therefore an a-political process.

In addition, the research tradition in relation to alcohol has been coloured by the clinical focus over the past several decades which has been oriented to concerns about long term harms as exhibited through chronic dependence. Public policy efforts, and associated research, have largely stemmed from this context. It has only been in relatively recent years that these underpinning notions have been challenged and attention broadened to include acute, short term harms and the policy and research implications around such.

For many decades the above conceptualisations of problems related to alcohol has significantly shaped both research and policy. Not only was long term harm the principal focus of attention, mean consumption of alcohol was the basic epidemiological descriptor. A major change in recent years involves recognition of the importance of patterns of consumption as a mediating factor for alcohol and harm. No longer is mean level of consumption, at either a national or individual level, considered a sufficiently sensitive measure in and of itself. Greater attention is now paid to various features of the patterns of consumption, as well as the overall volume. The context and settings in which drinking occurs now also plays a greater role in prevention research, albeit as an area where definitive research is yet to be undertaken.

A number of other relatively recent changes have also occurred. These include a greater focus on:

- drinking and young people;
- indigenous people;
- women;
- individuals suffering from concurrent mental health problems; and
- reconciling the health benefits of alcohol with harm reduction strategies.

The changing profiles and risk taking behaviours of young people have received growing attention and a body of research has been developed to examine this. However, it is noted that research into consumption patterns, and the psycho-social motivators for drinking, have been less well examined among this group than might be expected. Increasing interest has also been directed to the issue of intoxication as a major contributor to public health problems and to overall levels of community safety. Even occasional intoxication by persons who usually drink at very modest levels is now recognised as contributing markedly to the harms associated with alcohol use (Stockwell et al., 1996). A key public health preventive message today is to avoid intoxication, or at the very least apply risk reduction strategies in settings where alcohol is consumed (Roche, 1997).

Increased attention has also been directed to special sub-populations. For example in Australia, there has been growing concern about the need for alcohol policies to be tailored appropriately to the needs of indigenous Australians. Similarly, a major shift has occurred whereby the broadly consistent data supporting the health benefits of alcohol (largely for those aged over 45 years of age when consumed in moderate amounts) has been acknowledged and incorporated within public policy documents and research agendas. The latter has had an important impact on a fundamental tenet of alcohol policy, ie to take measures to ensure that everyone drinks less regardless of current consumption level.

Hence alcohol research, as it impinges on public policy, has become more complex and more diverse in recent years. Many of the existing and entrenched views in relation to alcohol and public policy have been thrown into question and subjected to greater scrutiny. This paper will therefore explore not just the last ten years of research but will do so in the context of some of the important conceptual shifts that have occurred, and with cognisance of their implications for both prevention research and subsequent policy development and implementation.

## Public policy as a preventive strategy

Attempts to minimise the negative consequences of alcohol use have existed for as long as alcohol has been available. Numerous studies, going back to the turn of the century, have examined the relationships between access to alcohol, per capita consumption and alcohol-related harm. Much of it is based on experiences in Europe and North America since the Second World War (see Bruun et al., 1975; Makela et al., 1981; Single et al., 1981; Moore and Gerstein, 1980; Moskovitz, 1989; Edwards et al., 1984; and Holder and Edwards, 1995), and more recently there has been a substantial body of work undertaken in Australia (see Stockwell, 1997).

Public policy strategies have been used extensively as a tool to prevent and reduce problems involving alcohol (Holder and Edwards, 1995). Governments in most industrialised societies have outlawed or limited private production of alcohol and thus have made alcohol a legal product with governmentally imposed rules regarding its production, promotion and distribution. As a result, alcohol products have been highly regulated in most industrialised countries. Important questions surround the efficacy and generalisability of such strategies to prevent or minimise harm.

“ In many countries, public emphasis regarding responses to the alcohol question has come to be laid more and more on education, information, and treatment, in recent decades. In addition, market forces and economic considerations have increasingly overshadowed preventive policies, and in some countries a strengthening of liberal attitudes has led to a stress on individual responsibility and a denial of the justification of any control measures. Accordingly, limiting the physical availability of alcoholic beverages or imposing high taxation as a means to control consumption and related harmful effects, are nowadays regarded by an increasing number of people as an archaic patchwork of laws and as irrelevant to contemporary life”. (Osterberg, 1995)

Most would agree that there is scope to further refine and improve existing regulations that govern alcohol. Many would further hold that the policies that are in place need to be enforced more efficiently to be able to fully assess their efficacy. The latter view is in contrast to those that would argue for a further liberalisation of current alcohol policies.

## Health and prevention issues

In assessing the contribution of alcohol use to harms experienced either individually or collectively it is essential to differentiate between the types of potential harms with which alcohol has been associated, as different types of harms have different policy implications. Types of problems associated with alcohol use have been characterised as those relating to:

| Category of problem  | Example of problems experienced   |
|--|---|
| <ul style="list-style-type: none"> <li>• Dependence</li> </ul>   | <ul style="list-style-type: none"> <li>• Withdrawal symptoms,</li> <li>• Loss of control,</li> <li>• Social disintegration</li> </ul>   |
| <ul style="list-style-type: none"> <li>• Regular use</li> </ul>  | <ul style="list-style-type: none"> <li>• Cirrhosis of the liver,</li> <li>• Cognitive impairment</li> <li>• Pancreas damage</li> <li>• Heart and blood disorders</li> <li>• Ulcers etc</li> </ul> |
| <ul style="list-style-type: none"> <li>• Intoxication</li> </ul> | <ul style="list-style-type: none"> <li>• Alcohol-related violence,</li> <li>• Risky behaviours,</li> <li>• Road trauma,</li> <li>• Falls etc</li> </ul>   |

A further typology of harms associated with alcohol use has been offered by Rehm and Fischer (1997) which differentiates problems experienced as a result of a single occasion of use versus problems resulting from long-term use.

|  | Single-occasion Use  | Long-term Use   |
|--|--|---|
| <b>Physiological</b>   | Overdose   | Mortality (eg. liver cirrhosis)<br>Morbidity (eg. gastritis, pancreatitis)                  |
| <b>Psycho-physiological and mental</b>                                   | Changed consciousness and control (hangover/suicide) injury to drinker | Dependence, Depression  |
| <b>Immediate Personal and Social Environmental (behavioural aspect)</b>  | Severe family and workplace disruption, injury to others, violence     | Disruption of social and economic relations   |
| <b>Wider Social and Cultural Level (determined by societal reaction)</b> | Criminal and informal sanctions  | Stigmatisation; coercion to change; treatment; criminalisation of alcohol-related behaviour |

The most effective prevention strategies for each category of alcohol-related problems are potentially different. For instance, strategies to minimise intoxication (eg service refusal, server liability) may be quite different to strategies to minimise problems of dependence (eg early opening hours and hours of extended trading).

## Availability policy and regulatory strategies

Although today's research related to alcohol policy covers a wide and diverse terrain historically, studies of availability policy have tended to focus on one or the other of a number of functional areas of constraint, including:

- densities of alcohol outlets,
- provision of alcohol to underage drinkers and, minimum drinking age laws on alcohol use and problems,
- the effects of alcohol taxes and pricing.

These areas, and others, are addressed below. It is further noted that this area is dealt with in more detail in the companion paper in this series on Community Interventions. As responsible server programs are discussed there, they are not dealt with in detail in this paper.

### Density of outlets

While much evidence suggests that changes in outlet densities are related to reduction in use, this evidence is not as solid as might be assumed, nor are the mechanisms relating reductions in physical availability to use and problems straightforward (Gruenewald and Stockwell, in press). From earlier Scandinavian studies of the 1970's (eg Amundsen, 1973; Osterberg, 1979; Poikolainen, 1980) it became evident that considerable complexity underlay the relationships between physical availability and alcohol use.

Variable results have been obtained in relation to density of outlets, with outcome variability partly attributed to methodological weaknesses. Nonetheless, some cross-sectional studies have revealed strong correlations between outlet densities and alcohol sales (e.g., Nelson, 1990) or self-reported alcohol use (e.g., Chaloupka and Wechsler, 1996). While cross-sectional evidence unanimously suggests that greater availability is related to greater sales and use, longitudinal evidence is mixed.

Some of the methodologically stronger longitudinal designs have indicated good to strong relationships between physical availability and sales (Ensor and Godfrey, 1993; Gruenewald, Ponicki and Holder, 1993). A limited number of recent studies have strongly suggested a relationship of physical availability to the geographic distributions of motor vehicle crashes (Gruenewald, et al., 1996; Gruenewald and Johnson, 2000), alcohol-related pedestrian injury collisions (LaScala, Gerber and Gruenewald, 2000) and between availability and violence (Stevenson, Lind and Weatherburn, 1998). Additional longitudinal evidence supporting these observations comes from research on alcohol-related traffic crashes (Australia, Gruenewald, et al. 1999), injuries (US, Chiu, Perez and Parker, 1997) and crime (Great Britain, Ensor and Godfrey, 1993).

Over the past decade, relatively large-scale studies (e.g., Gruenewald, Ponicki and Holder, 1993; Wagenaar and Holder, 1996) have been complemented by small-scale studies of geographic relationships between outlet locations, drinking populations and problem outcomes. This shift has been motivated by two observations. First, the range of physical availability across smaller areas is very large and provides a good setting to test for availability effects. Second, the impact of availability on use and problems is well documented at this level of geographic resolution (see Scribner, MacKinnon and Dwyer, 1995; Gruenewald, et al., 1996; Speer, et al., 1998). Within smaller community areas the range of availability fluctuates by several orders of magnitude and the distributions of alcohol-related motor vehicle crashes and violence are clearly delineated. Within community areas one can study detailed relationships between outlets, alcohol sales and drunken driving (relating particular problems to particular types of outlets, Gruenewald, et al., 1999) and separate outlet density effects from the effects of alcohol sales (Stevenson, Lind and Weatherburn, 1998). It is also within these community areas that the policy relevance of availability studies is most evident. Such studies have great potential value to local policy makers in relation to critical local licensing decisions e.g. the issuing of new licenses, extensions of trading hours and zoning.

Much of the research previously undertaken has been criticised for its methodological weakness. Most work involves descriptive correlational studies and thus are inherently weak, but the more recent work has shown substantial improvement in terms of technical sophistication. The lack of investigative sophistication and explanatory models is taken up later in this paper.

As part of these increasingly sophisticated approaches, recent availability studies have employed spatial analysis techniques that enable controls for statistical characteristics unique to small area data (e.g., spatial autocorrelation, the tendency of measures from adjacent geographic units to resemble one another) and examination of the spatial interactions of problems across neighbourhood areas (spatial lag effects). For example, Gruenewald et al (1996) studied the geographic patterning of alcohol-related crashes across four communities in California and found that alcohol-related crashes most often took place in neighbourhoods containing the largest densities of restaurants (not bars). In addition, analysis of spatial lag effects revealed rates of alcohol-related crashes in target neighbourhoods were directly related to outlet densities in adjacent neighbourhoods.

Other studies have used similar geostatistical techniques to examine the relationships between outlet densities and violence. Rates of youth violence in minority neighbourhoods appear related to greater off-premise outlet densities (Alaniz, Cartmill and Parker, 1998), rates of alcohol-related pedestrian injuries are greater in neighbourhoods near on-premise outlets (LaScala, Gerber and Gruenewald, 2000), and rates of violent assaults are greater in high density outlet areas selling greater proportions of specific beverage types (i.e., high alcohol beer and spirits, Stevenson, Lind and Weatherburn, 1998). Gorman et al. (2000) replicated the observation that outlet densities are related to violence in neighbourhood areas, but added that rates of violence are also related to the sociodemographic characteristics of adjacent neighbourhoods. Not only is the level of impoverishment of target neighbourhoods relevant to rates of violence, but the impoverishment of other adjacent nearby neighbourhoods is also important. Using a related technique (generalized potentials), Wieczorek and Coyle (1998) have begun to identify the types of community neighbourhoods in the US that are more likely to produce drunken drivers (i.e., areas with larger populations of youthful, lower educated, white males with unskilled jobs).

Examination of the literature in relation to density of outlets has highlighted a number of important points. Firstly, the extensive work carried out in several countries over more than three decades is variable. Moreover, generalisability from such studies is difficult. Many of the studies are methodologically weak and rely on nothing stronger than descriptive correlations at best as evidence of the efficacy of a particular intervention. Such previous work was hamstrung by the lack of available research tools. Very recent work has been able to take advantage of new research techniques and technologies. Moreover, a greater level of conceptual sophistication has emerged in much of the more recent work, with a growing emphasis on systems approaches (in contrast to single factor interventions) and ecological explanatory models.

Clearly, outlet density matters greatly from a public health perspective. The increasing sophistication in very recent studies will prove to be an increasingly valuable tool for local planners and policy makers in determining where and when different types of liquor licenses are likely to contribute to increased levels of harm. What is also increasingly evident is that research data at the local level is required to inform local decision making.

The above research strongly suggests that limits on outlet density may be an effective means of controlling alcohol problems and an effective policy tool for the reduction of alcohol-related harm. However, further research into the effectiveness of these policies needs to be conducted. Future research on this topic will need to be better informed by theoretical models of the manner in which availability, consumption and harm interact across different harm domains. It seems that each problem studied at the community and neighbourhood level will require its own theoretical analysis. For example, models of alcohol-related crashes in which the relationships between sources of drinkers, sources of drink, and driving patterns are the focus of attention (Gruenewald, et al., 1996) cannot be directly extended to studies of alcohol-related violence; there the dynamics of aggressive interactions within alcohol environments matter a great deal (Parker and Auerhahn, 1998) and the relationships between locations

of violent acts, residences of victims and offenders, and alcohol outlets are key. Further development, empirical testing and refinement of these different models hold the promise of providing a rational basis for decisions about outlet densities at the local area level.

## The drinking setting

Beyond the density of licensed outlets (whether on- or off- premise, and all that that entails) the important question of the types of drinking environments are another important contextual factor. Stockwell et al (1992a) examined a unique set of data regarding alcohol-related harm (assaults, road crashes and drink driving offences) and consumption (alcohol sales recorded for taxation purposes) at the level of individual licensed premises. On the basis of units of alcohol sold per premise, it was found that among on-premise establishments, nightclubs, taverns and hotels were high risk for having customers involved in drinking and driving offences, crashes and assaults. A further study demonstrated that the highest risk premises were those whose patrons were more likely to have high blood alcohol levels on exiting (Stockwell et al, 1992b). Gruenewald et al (1999) also conducted analyses on these data and detected significant relationships between the types of beverages sold at individual premises and patterns of drink-driving offences - increases over time in sales of lower strength beers from these premises were associated with reductions in drinking and driving offences.

The above studies begin to form the basis for providing empirical evidence upon which to base licensing decisions - both in terms of general principles and also in terms of specific situations at a particular locality. For example, these research findings provide the basis for establishing when a more relaxed approach might be taken by licensing authorities in issuing licenses for 'low risk' premises and tighter controls on hotels and nightclubs. With sound data sets, such as those outlined above, communities might act to site new premises in 'low risk' rather than 'high risk' locations. It is relevant to note that with deregulation of licensing in Victoria the great increase in licensed venues was in a low risk category - small restaurants and wine bars (Storey et al, 1998).

The future of policy applications from this approach, of course, requires considerably more research. Much is yet to be learnt regarding the types of specific local factors that may either protect against or facilitate the occurrence of harm. For example, a recent study by Gruenewald and Johnson (2000) demonstrated that effects of outlet densities on alcohol-related crash rates are strongly contingent upon local traffic flow and the available pool of drinking drivers. Effects of outlets are strongest in areas of communities where there is considerable traffic flow and which are near to larger populations of drinking drivers (spatial lags). Thus, the contextual dependence of these effects on local conditions again supports the argument regarding the contingent nature of availability. It also provides the first indications of an effective direction for local outlet policy. In the future, local communities may be able to assess specific neighbourhood characteristics before licensing alcohol outlets, placing new outlets in low risk areas.

## Price and alcohol consumption control

Price of alcohol products has been examined for some decades as a potential mechanism by which to control consumption. Over this time period, the legitimacy of pricing policy as a means to affect alcohol problems is argued to have increased (Osterberg, 1995). And the conclusion reached by Bruun et al in 1975 that in many respects, alcohol beverages behave like other commodities on the market, so that their consumption is affected by the price level, continues to be supported. Research generally finds that alcohol taxes and prices affect alcohol consumption and associated consequences (Leung and Phelps, 1993).

There is some evidence that supports the contention that it was only, or mainly, heavy or problem drinkers that would be affected by price changes. Some research suggests that the heaviest-drinking, ie 5 % of drinkers, do not reduce their consumption significantly in response to price increases, unlike drinkers who consume alcohol at lower levels (Manning et al., 1995). In one study, heavy drinkers who were unaware of the adverse health consequences of their drinking were less responsive to price

changes than either moderate drinkers or better informed heavy drinkers (Kenkel, 1996). However, more recent work with improved methodologies suggest that both moderate and heavy drinkers are affected by price changes. Nonetheless, it is also important to bear in mind that there is a very wide range of elasticity values for alcohol across different countries and cultural settings (Godfrey and Maynard, 1995). Similarly, price elasticities also vary according to beverage type.

Some studies have demonstrated that increased beer prices lead to reductions in the levels and frequency of drinking and heavy drinking among youth (Coate and Grossman, 1988; Grossman et al., 1987). Higher taxes on beer have also been found to be associated with lower traffic crash fatality rates, especially among young drivers (Ruhm, in press; Saffer and Grossman, 1987), and with reduced incidence of some types of crime (Cook and Moore, 1993). Research on price by Grossman and colleagues (Grossman et al., 1987) and Coate and Grossman (1988) examined whether the young heaviest drinkers would be affected by price policies that target the population as a whole. They analysed factors affecting beer consumption by youths based on data from nationwide health surveys. They found that higher prices for beer were associated with a lower frequency of beer consumption among youth and that the difference was more pronounced for heavier consumers (one to seven drinks per week) than for lighter consumers (less than one drink per week). Research by Laixuthai and Chaloupka (1992), using computer simulation techniques, produced results consistent with these findings. These findings are significant for policy development because they provide scientific data for evaluating the effect of a policy option.

Cook (1981) studied the impact of 39 changes in State taxes on distilled spirits between 1960 and 1975. In 30 of the 39 instances, sales of distilled spirits fell after the tax increase. Reduced sales were accompanied by reduced traffic fatalities. Work is currently underway in both Australia and overseas to study the implications of such policy options as equalising the taxes on beer, wine, and distilled spirits based on their alcohol content; setting alcohol taxes high enough to match the social costs incurred as a result of alcohol abuse; and raising taxes to offset the effects of inflation (Saffer and Grossman, 1992; Chaloupka, in press).

## Hours and days of sale

Changes in alcohol availability have been monitored in many countries over long periods of time. Significant changes, such as the shift to the introduction of alcohol sales on a Sunday in various localities, have been repeatedly found to result in increases in road deaths and injuries and/or violence (Smith, 1988; Peberdy 1991). Such increases were also previously found in New South Wales, even though alcohol had previously been available on Sundays through clubs.

More recently, extended trading hours have been investigated in Western Australia to examine the impact of even minor changes of one to two hours for closing (Chikritzhs and Stockwell, 1998). Results indicated a shift in the peak time for intoxicated drivers on the road to after midnight and also an increased blood alcohol level of drivers involved in crashes who had last drunk at licensed premises. This shift in peak risk times also coincides with lower levels of police activity on the roads (ie after midnight). They also found a doubling in assault rates in premises with extended trading hours and significant relative differences in levels of alcohol-related road crashes.

As part of the Surfers Paradise Safety Action project (Homel, 1997) closing times for nightclubs in a concentrated vicinity of Surfers Paradise were trialled. The rationale for extended and staggered closing times was to prevent the simultaneous disgorging of large numbers of intoxicated young men (primarily) onto the streets at 3am. Some degree of success was achieved through extended and staggered closing times. However, there was a subsequent community reaction, largely from elderly retirees who were early risers and who were discomforted by encountering intoxicated young men at 5am and 6am in the local shopping malls and on the beaches. Community pressure was subsequently exerted to revert to the previous earlier closing times.

## Warning labels

The USA have mandated warning labels on containers of alcoholic beverages which aim to inform and remind drinkers that alcohol consumption can result in birth defects, impaired ability to drive a car or operate machinery, and health problems. Research indicates that public support for warning labels is extremely high; that awareness of the label's content has increased substantially over time (MacKinnon, 1995); but that perception of the described risks was high before the label appeared and has not generally increased (Hilton, 1993); and that the label has not had important effects on hazardous behaviour, although certain effects may be indicative of the early stages of behavioural change (MacKinnon, 1995).

Some alcohol-related behaviour, as opposed to attitudes about drinking, may have changed coincidentally with the introduction of the warning labels. In recent studies, the proportion of respondents reporting that they had decided not to drive because they had too much to drink increased from 35 % in 1989 to 43 % in 1991 (Graves, 1992; Greenfield et al., 1992). Among women of childbearing age, the proportion who reported limiting their drinking because of concern about health problems rose from 18 % in 1989 to 25 % in 1990 and 28 % in 1991. However, other risky behaviours related to the warning labels had not changed during this period (Graves, 1992; Greenfield et al., 1992).

In a recent review of progress on US mandatory warning labels, Greenfield (1997) describes the strategy as having taken four to five years for exposure levels to flatten out. He reports that the label is reaching its intended audience: by 1994 about half of drinkers were aware of the labels and over four-fifths of the heaviest drinking males were being reached by the messages. He notes that 90% of survey populations were in favour of the labels and believed that they were effective. Greenfield (1997) further notes that the warning labels also stand as a counterbalance to the overly enthusiastic assertions of health benefits that some in the alcohol industry are keen to include in the labelling.

## Responsible server programs

Host responsibility and responsible management practices are increasingly seen as the key to improving the drinking environment (Saltz, 1987; Single, 1994). Bar staff continuing to serve 'obviously intoxicated' patrons has also been identified as a predictor of harm (Stockwell et al., 1993). As such on-license premises offer important opportunities for effective prevention and enforcement efforts (Room 1984; McKnight and Streff, 1994). Responsible server programs have become a common way to reduce alcohol-related harms over the past decade. Such approaches have reported moderate success, especially if combined with enforcement (Stockwell, 1997; Saltz, 1987; Putnam et al., 1993).

Server training, now mandatory in some states in the US, educates alcohol-servers to alter their serving practices, particularly with underage customers and those who show obvious signs of intoxication. Server training explains the effects of alcohol, applicable laws, how to refuse service to obviously intoxicated patrons, and how to assist customers in obtaining transportation as an alternative to driving. Some, but not all, studies report more interventions with customers after server training than before. One evaluation of the effects of Oregon's mandatory server-training policy indicates that it had a statistically significant effect on reducing the incidence of traffic crashes in that State (Holder and Wagenaar, 1994).

Licensed premises are complex environments. Numerous factors intertwine to produce negative consequences from alcohol consumption. The patterns, and therefore recommendations, are also complex. No simple single dimension or set of principles exists. Even similar alcohol policies may yield different results in different societies because of the different economic, cultural, political, and social circumstances (Osterberg, 1995).

It has been argued that prevention involves a shift from thinking in terms of offenders and their motivations to offences and their settings, which in the case of licensed premises implies a focus on management practices that give rise to unsafe environments (Hauritz et al., in press). Aspects of safe environments include:

- alcohol serving practices
- physical design
- selection and training of security staff
- the permissiveness of the social climate in venues
- hidden deals between managers and police

Situational theory has been applied to the drinking environment and includes:

- rule setting (through Codes of Practice)
- stimulating conscience (by encouraging managers to regard themselves as responsible businessmen)
- controlling disinhibitors (by controlling alcohol through server intervention)
- facilitating compliance (by creating a regulatory environment in which it is financially worthwhile for licensees to adhere to the Code of Practice)

(Hauritz et al., in press)

## Drinking age

The age at which members of any given community are deemed entitled to access and consume alcohol has long been a matter of debate. Different cultures hold substantially differing views. There is some recent US research which indicates that the earlier that a person commences drinking the greater the likelihood that they will develop alcohol-related problems later in life (Grant and Dufour, 1999). However, some would argue that such outcomes are context specific, such that where alcohol use by those of a given age is strongly sanctioned then abrogating those sanctions carries different meaning and consequences, than when alcohol is consumed by young people in cultures where alcohol use is condoned and socially facilitated.

Available research, which is largely from the US, has generally found that raising the minimum legal drinking age for alcohol typically reduces use of alcohol among underage drinkers (Wagenaar, 1986), but also that such effects appear strongly contingent upon enforcement. Within the US with a minimum drinking age of 21, 50% of alcohol outlets are estimated to sell to youth who look about 18 years of age (Grube, 1997). Maintaining minimum legal drinking age restrictions generally take up additional community resources (Grube, 1997), including police enforcement of minimum drinking age laws, server liability laws that hold servers legally responsible for sales to underage youth, and responsible beverage service programs that educate servers to responsibly refuse service to minors. Minimum drinking age laws may also be undermined by the social networks through which alcohol is obtained. For example, if an underage drinker is able to find an of-age drinker to purchase alcohol (Forster 1994), then no degree of enforcement of underage sales laws will have an effect on underage access. These latter factors raise consideration of the efficacy of particular preventive interventions versus their efficiency - important concerns for policy makers and those allocating resources.

Policies affect the nature of availability itself in community settings and enforcement efforts affect the degree to which regulatory policies are followed by community members. But these effects are not to be confused with direct measures of the availability of alcohol. Regulations may be put in place to eliminate sales to alcohol among young people, and these regulations vigorously enforced to reduce underage access to alcohol (effectively shown in Grube, 1997), but these regulatory and enforcement efforts may not reduce youth access to alcohol. Youth may simply obtain alcohol through other means (e.g., older users). A more general systems description of the mechanisms of youth access to alcohol is called for and, importantly, more thorough distinctions are to be made regarding the nature of policy change, enforcement efforts, reductions in availability and their impacts on target groups.

## Control policies vs harm minimisation approaches

In recent years, there have been a number of challenges to the traditional precepts underpinning alcohol control theories. One argument is that reduced alcohol consumption is not necessarily required to reduce problems associated with alcohol use. Empirical evidence to support this position is found in the data on the reduction of alcohol-related road trauma and random breath testing (RBT) in Australia. The evidence of the efficacy of RBT is probably the most persuasive of any form of community invention and prevention approaches (Homel, 1993). Significant improvements were achieved with respect to alcohol-related road trauma, including both morbidity and mortality, without changing (or even attempting to change) the overall level of alcohol consumption among the targeted communities.

RBT stands as an exemplar of both a successful community intervention and also as a challenge to the notion of a blanket reduction in consumption as the preferred and only option to achieved reduced alcohol-related problems. Various other forms of interventions have subsequently been successfully undertaken from a harm minimisation perspective and these will be compared below with traditional control approaches which necessitate reduced consumption.

The counter view is that per capita consumption is a powerful predictor not only of long term harm but also of short term problems such as road trauma. Skög (in press), for instance, has shown that per capita consumption is closely related to injury related deaths, including road trauma for different regions of Europe over two to three decades.

## Future research implications

An important challenge for the development of evidence-based alcohol policy will be the application of more sophisticated research methods to future studies and their interpretation and policy implications. For example, to determine a means to establish optimum geographic distributions of different types of availability restrictions for a range of different community contexts requires different types of studies than those traditionally conducted by alcohol policy researchers. Studies will also be required on more localised geographical areas because of what has been learned of the lack of generalisability of findings from larger scale studies. Similarly, greater attention needs to be directed to the complex and multifactorial nature of alcohol and alcohol-related problems; an intervention deigned to address one issue may not similarly address other problems (and can even be counter-productive). Using physical availability as an example, the local effects of distributions of alcohol outlets on one problem (e.g. traffic crashes) may be quite different from the local effects on another (e.g., violence). Thus, over-concentrations of outlets in downtown retail areas may contribute relatively little to alcohol-related crashes (Gruenewald and Johnson, 2000) but very much to increased rates of violence (Gorman, et al., 2000). The dispersion of these same outlets into areas of greater traffic flow may aggravate alcohol-related crash rates while mitigating violent events. Although it is much too early for the scientific research evidence to speak comprehensively to these issues, that they can be broached in current scientific discourse represents a major step forward in the field. Next steps will require much more detailed understanding of the genesis and distribution of alcohol problems across community areas.

## Conclusion

Drinking behaviour is complex and is influenced by a multitude of factors. The complex array of factors which may impinge on whether an individual drinks, how much they drink and where they choose to drink is influenced by factors such as:

- price, promotion, access
- law enforcement
- public health pressures (eg anti drink driving messages)
- cultural norms
- religiosity and religious persuasion
- individual factors (including socio-economic status)
- psycho-social factors (such as drinking expectancies)
- elements of the drinking environment
- economic factors

Traditional alcohol control theory has been limited in its focus and has not widely addressed the full range of issues which impact on alcohol use and alcohol-related harms and potential strategies for minimising such harms. Further, previous research has been hampered by technical, methodological and conceptual limitations. More recent work has begun to address some of these limitations.

In general terms, the following findings are supported by the literature:

- Overall availability used in isolation is an insensitive measure and can now be supplemented by other more sophisticated tools.
- The number of outlets and hours of trading are not strong and consistent predictors of problems, with some important exceptions such as remote and geographically isolated areas or in concert with certain socio-economic circumstances (eg high unemployment levels, lack of social restraints).
- Price remains one of the consistent measures and predictors of alcohol consumption in general terms. At specific points in time, pricing and other strategies (free drinks, cheap drinks) which encourage excessive consumption and intoxication, with the potential for obvious harmful consequences, are strongly contraindicated.
- The nature of the licensed environment is highly predictive of problems.
- Improved controls to prevent sales to underage drinkers and intoxicated patrons are of increasing importance, with evidence of need to improve compliance in this area. Use of improved training of managers and staff and compulsory training of licensees is supported.
- Ease of access to alcohol for young and very young drinkers is highly predictive of problems. As these drinkers do not usually frequent on-license premises there are important implications here for the provision of alcohol through off-license premises (such as supermarkets, convenience stores and petrol stations). As such, there is a good basis for curtailing sale of alcohol through these outlets, or at the very least, requiring sales staff to be of legal drinking age and registered and trained to sell alcohol. This would necessitate acquisition of specific skills in service refusal. This is seen as a strong but important measure to safeguard young people.
- Enforcement strategies have been demonstrated to have great potency but are generally under-utilised. Greater use of enforcement strategies is supported. Lack of enforcement needs to be treated seriously and addressed in a systematic manner at a structural level.

- Scope exists for an educational and facilitative role for liquor licensing authorities. It is evident that many licensees are unaware of many aspects of the liquor licensing legislation. The likelihood of achieving compliance is therefore substantially compromised. This can be easily remedied and the licensing authorities provide an obvious vehicle through which this could be achieved.
- Given the highly variable and situation specific nature of much of the evidence about alcohol availability and harms, it is recommended that any changes be implemented in an incremental and step-wise fashion. In this way, major changes are not introduced which later prove to be both unsatisfactory and difficult to amend or revoke.

Not covered in this paper (due to limitations of time and space) are issues related to the advertising, marketing and point of sale and other promotional activities associated with beverage alcohol. From a public health perspective these issues have become increasingly important in recent years, and made even more pertinent in light of recent loosening of commercial strictures in general and the expansion of notions of free trade unimpeded by government interference. Areas for potential research advances in this area are flagged.

## Research recommendations

On the basis of the literature examined the following recommendations for future research activities have been identified:

- well controlled studies examining the impact of regulatory policy changes on drinking patterns as well as levels of consumption and levels of harm, with particular reference to specific sub groups such as women (including pregnant women), young people, those with mental illness and indigenous people and other more vulnerable groups in the community;
- with the increasing emphasis on the concept of 'patterns of consumption' and its application in epidemiological contexts, more precise and rigorous definitions of 'patterns' is required;
- the development and implementation of a data collection and monitoring system for youth alcohol consumption, similar to that currently undertaken for illicit drugs (ie the IDRS);
- further development of local, state, and national indicators of high risk consumption and alcohol-related harm in order to rigorously evaluate policy changes;
- development of a practical scale for identification of high risk licensed premises;
- examination of strategies by which to modify relevant activities of high risk licensed premises (eg sales to minors, sales to intoxicated patrons, over-crowding);
- studies to examine ways to foster safer drinking practices among young people;
- collaborative investigations with indigenous communities on ways to reduce alcohol-related harm, particularly as pertaining to urban indigenous people;
- process and outcome evaluation of the alcohol industry's self monitoring system with regard to advertising, and noting any limitations such as lack of inclusion of point of sale promotion, new promotional activities, eg sales via the internet; and
- development of a nationally consistent and co-ordinated data set on alcohol sales, such that regional breakdowns of patterns of sales by beverage type and alcoholic strength can be made. Further that such efforts be undertaken with access to data held by the alcohol industry.

## References

- Alaniz, M.L., Cartmill, R.S. & Parker, R.N. (1998). Immigrants and violence: The importance of neighborhood context. *Hispanic Journal of Behavioral Sciences*, 20, 155-174.
- Ashley, M.J. & Rankin, J.G. (1988). A public health approach to the prevention of alcohol-related health problems. *Annual Review of Public Health*, 9, 233-271.
- Bennett, P., Murphy, S. & Bunton, R. (1992). Preventing alcohol problems using healthy public policy. *Health Promotion International*, 7, 297-306.
- Bruun, K. (1975). Alcohol control policies in public health perspective. *Finnish Foundation for Alcohol Studies*, 25, Helsinki.
- Chaloupka, F.J. (in press). Price and taxation strategies for preventing alcohol-related problems. *Alcohol Health & Research World*, in press.
- Chaloupka, F.J. & Wechsler, H. (1996). Binge drinking in college: The impact of price, availability, and alcohol control policies. *Contemporary Economic Policy*, 14, 112-124.
- Chikritzhs, T. & Stockwell, T. (1998, February). *Impact of longer trading hours on the timing of road crashes and drivers' blood alcohol levels*. Paper presented at the 2nd International conference on drinking patterns and their consequences, Perth, Western Australia.
- Chiu, A.Y., Perez, P.E. & Parker, R.N. (1997). Impact of banning alcohol on outpatient visits in Barrow, Alaska. *Journal of the American Medical Association*, 278, 1775-1777.
- Coate, D. & Grossman, M. (1988). The effects of alcoholic beverage prices and legal drinking ages on youth alcohol use. *Journal of Law and Economics*, 31(1), 145-171.
- Cook, P.J. (1981). The effect of liquor taxes on drinking, cirrhosis, and auto accidents. In M.H. Moore, M.H. & D.R. Gerstein (Eds.), *Alcohol and Public Policy: Beyond the Shadow of Prohibition* (pp. 255-285). Washington, DC: National Academy of Sciences.
- Cook, P.J. & Moore, M.J. (1993). Economic perspectives on reducing alcohol-related violence. In S.E. Martin (Ed.), *Alcohol and interpersonal violence: Fostering multidisciplinary perspectives* (pp 193-212). National Institute on Alcohol Abuse and Alcoholism Research Monograph No. 24, NIH Pub. No. 93-3496. Rockville, MD: the Institute.
- Ensor, T. & Godfrey, C. (1993). Modelling the interactions between alcohol, crime, and the criminal justice system. *Addiction*, 88, 477-487.
- Forster, J.L., McGovern, P.G., Wagenaar, A.C., Wolfson, M., Perry, C.L., & Anstine, P.S. (1994). The ability of young people to purchase alcohol without age identification in northeastern Minnesota, USA. *Addiction*, 89, 699-705.
- Godfrey, C. & Maynard, A. (1995). The economic evaluation of alcohol policies. In H. Holder & G. Edwards, *Alcohol and Public Policy: Evidence and Issues*. Oxford: Oxford University Press.
- Gorman, D.M., Speer, P.W., Gruenewald, P.J. & Labouvie, E.W. (2000). Neighborhood structure, alcohol availability and violent crime: A test of social disorganization and routine activities theory. *Social Problems*, 47,
- Grant, B. & Dufour, M. (1999). (p13)
- Graves, K.L. (1992, June). *Do warning labels on alcoholic beverages make a difference?: A comparison of the United States and Ontario, Canada between 1990 and 1991*. Paper presented at the 18th Annual Alcohol Epidemiology Symposium, Toronto, Ontario, Canada.
- Greenfield, T.K. (1997). Warning labels: Evidence on harm reduction from long-term American surveys. In M. Plant, E. Single & T. Stockwell (Eds.), *Alcohol: Minimising the harm*. London: Free Association Press.

- Grossman, M., Coate, D. & Arluck, G.M. (1987). Price sensitivity of alcoholic beverages in the United States: Youth alcohol consumption. In H. Holder (Ed.), *Control issues in alcohol abuse prevention: Strategies for states and communities. Advances in Substance Abuse*, Suppl. 1, pp 169-198. Greenwich, CT: JAI Press.
- Grube, J.W. (1997). Preventing sales of alcohol to minors: Results from a community trial. *Addiction*, 92, (Suppl. 2), 251-260.
- Gruenewald, P.J. & Johnson, F.W. (in review). Drinking, driving and crashing: A traffic flow model of alcohol-related motor vehicle accidents. *Addiction*, in review.
- Gruenewald, P.J., Millar, A.B., Treno, A.J., Yang, Z., Ponicki, W.R. & Roeper, P. (1996). The geography of availability and driving after drinking. *Addiction*, 91, 967-983.
- Gruenewald, P.J., Ponicki, W.R. & Holder, H.D. (1993). The relationship of outlet densities to alcohol consumption: A time series cross-sectional analysis. *Alcoholism: Clinical and Experimental Research*, 17, 38-47.
- Gruenewald, P.J., Roeper, P. & Millar, A. (1996). Access to alcohol: Geography and prevention for local communities. *Alcohol Health & Research World*, 20, 244-251.
- Gruenewald, P.J., Stockwell, T., Beel, A., & Dyskin, E.V. (1999). Beverage sales and drinking and driving: The role of on-premise drinking places. *Journal of Studies on Alcohol*, 60, 47-53.
- Hauritz, M., Homel, R., McIlwain, G., Burrows, T. & Townsley, M. (in press). Reducing violence in licensed venues through community safety action projects: The Queensland experience. *Contemporary Drug Problems*, in press.
- Hilton, M.E. (1993). An overview of recent findings on alcoholic beverage warning labels. *Journal of Public Policy & Marketing*, 12(1), 1-9.
- Holder, H. & Edwards, G. (Eds.). (1995). Research as a basis for rational policies on alcohol consumption. In *Alcohol and Public Policy: Evidence and Issues*. Oxford: Oxford University Press.
- Holder, H. & Wagenaar, A.C. (1994). Mandated server training and reduced alcohol-involved traffic crashes: A time series analysis of the Oregon experience. *Accident Analysis and Prevention*, 26, 89-97.
- Homel, R. (1993). Random breath testing in Australia: Getting it to work according to specifications. *Addiction*, 88, (Suppl.), 27-33.
- Homel, R. (1997). Editor's Introduction - Policing for prevention: Reducing crime, public intoxication and injury. In: *Policing for prevention: Reducing crime, public intoxication and injury*, Ed. R Homel, *Crime Prevention Studies*, Vol. 7 RV Clarke, Series Editor. USA: Willow Tree Press.
- Kenkel, D.S. (1996). New estimates of the optimal tax on alcohol. *Economic Inquiry*, XXIV(2), 296-319.
- Laixuthai, A. & Chaloupka, F.J. (1992, July). Youth alcohol use and public policy. Paper presented at the meeting of the Western Economic Association, San Francisco.
- LaScala, E.A., Gerber, D. & Gruenewald, P.J. (in press). Demographic and environmental correlates of pedestrian injury collisions: A spatial analysis. *Accident Analysis & Prevention*, in press.
- Leung, S-F. & Phelps, C.E. (1993). "My kingdom for a drink . . .?": A review of the estimates of the price sensitivity of demand for alcoholic beverages. In M.E. Hilton & G. Bloss (Eds.), *Economics and the Prevention of Alcohol-Related Problems*. National Institute on Alcohol Abuse and Alcoholism Research, pp 1-31. Monograph No. 25. NIH Pub. No. 93-3513. Rockville, MD: The Institute.
- MacKinnon, D.P. (1995). Review of the effects of the alcohol warning label. In R.R. Watson (Ed.), *Alcohol, cocaine, and accidents*. Totowa, NJ: Humana Press.
- Makela, K., Room, R., Single, R., Sulkunen, P. & Walsh, B. (1981). *Alcohol, society and the state* (Vol. 1). Toronto: Addiction Research Foundation.
- Manning, W.G., Blumberg, L. & Moulton, L.H. (1995). The demand for alcohol: The differential response to price. *Journal of Health Economics*, 14(2), 123-148.

- McKnight, A.J. & Streff, F.M. (1994). The effect of enforcement upon service of alcohol to intoxicated patrons of bars and restaurants. *Accident Analysis and Prevention*, 26, 79-88.
- Moore, M. & Gerstein, D. (Eds.). (1980). *Alcohol and public policy: Beyond the shadow of prohibition*. Washington DC: National Academy Press.
- Mosher, J.F. & Jernigan, D.H. (1989). New directions in alcohol policy. *Annual Review of Public Health*, 10, 245-279.
- Moskovitz, J.M. (1989). The prevention of alcohol problems: A critical review of the research literature. *Journal of Studies on Alcohol*, 50, 54-88.
- Nelson, J.P. (1990). State monopolies and alcoholic beverage consumption. *Journal of Regulatory Economics*, 2, 83-98.
- Osterberg, E. (1995). Do alcohol prices affect consumption and related problems? In H. Holder & G. Edwards, *Alcohol and public policy: Evidence and issues*. Oxford: Oxford University Press.
- Parker, R.N. & Auerhahn, K. (1998). Alcohol, drugs, and violence. *Annual Reviews of Sociology*, 24, 291-311.
- Peberdy, J.R. (1991). Prior drinking locations of drivers killed in Victoria. In T. Stockwell (Ed.), *The licensed drinking environment: Current research in Australian and New Zealand*. Proceedings of the National Workshop on Research into the Licensed Drinking Environment, Melbourne, May 1991. Perth: National Centre for Research into the Prevention of Drug Abuse, Curtin University of Technology.
- Putnam, S.I., Rockett, I.R. & Campbell, M.K. (1993). Methodological issues in community-based alcohol-related injury prevention projects. In T.K. Greenfield & R. Zimmerman (Eds.), *Center for substance abuse, Prevention*, Monograph 14. Rockville, MD: USA Department of Health and Human Services.
- Rehm, J. & Fischer, B. (1997). Measuring harm: Implications for alcohol epidemiology. In M. Plant, E. Single & T. Stockwell (Eds.), *Alcohol: Minimising the Harm*. London: Free Association Press.
- Roche, A.M. (1997). The shifting sands of alcohol prevention: Rethinking population control approaches. *Australian and New Zealand Journal of Public Health*, 21, 621-625.
- Room, R. (1984). Alcohol control and public health. *Annual Review of Public Health*, 5, 293-317.
- Ruhm, C. J. (in press). Alcohol policies and highway vehicle fatalities. *Journal of Health Economics*, in press.
- Saffer, H. & Grossman, M. (1987). Beer taxes, the legal drinking age, and youth motor vehicle fatalities. *Journal of Legal Studies*, 16(2), 351-374.
- Saltz, R. (1987). The roles of bars and restaurants in preventing alcohol-impaired driving: An evaluation of server training. *Evaluation in Health Professions*, 10, 5-27.
- Scribner, R.A., MacKinnon, D.P. & Dwyer, J.H. (1995). The risk of assaultive violence and alcohol availability in Los Angeles County. *American Journal of Public Health*, 85(3), 335-340.
- Single, E. (1994). What can we do about problematic drinking environments?: Licensing initiatives in Canada. Paper presented at the Perspective for Change Conference, Rotorua, NZ.
- Single, E., Giesbrecht, N. & Eakin, B. (Eds.). (1981). *Alcohol, society and the state: A social history of control policy in seven countries* (Vol. 2). Toronto: Addiction Research Foundation.
- Smith, D.I. (1988). Effectiveness of restrictions on availability as a means of preventing alcohol-related problems. *Contemporary Drug Problems*, Winter, 627-684.
- Solomon, R. (1994). Overview and analysis of liquor review findings: Liquor policy at the crossroads. *Liquor licensing seminar proceedings*, Alcohol Advisory Council of WA.
- Speer, P.W., Gorman, D.M., Labouvie, E.W. & Ontkush, M.J. (1998). Violent crime and alcohol availability: Relationships in an urban community. *Journal of Public Health Policy*, 19(3), 303-318.

- Stevenson, R.J., Lind, B. & Weatherburn, D. (1999). Relationship between alcohol sales and assault in New South Wales, Australia. *Addiction*, Vol. 94(3), p397-410.
- Stockwell, T. (1997). Regulation of the licensed drinking environment: A major opportunity for crime prevention. In R. Homel (Ed.), *Policing for prevention: Reducing crime, public intoxication and injury, crime prevention studies*, Vol. 7. New York: Criminal Justice Press.
- Stockwell, T., Hawks, D., Lang, E. & Rydon, P. (1996). Unravelling the preventive paradox for acute alcohol problems. *Drug and Alcohol Review*, 15, 7-15.
- Stockwell, T., Lang, E. & Rydon, P. (1993). High risk drinking settings: The association of serving and promotional practices with harmful drinking. *Addiction*, 88, 1519-1526.
- Stockwell, T., Rydon, P., Gianatti, S., Jenkins, E., Ovensden, C. & Syed, D. (1992b). Levels of drunkenness of customers leaving licensed premises in Perth, Western Australia: A comparison of high and low 'risk' premises. *British Journal of Addiction*, 87, 873-881.
- Stockwell, T., Somerford, P. & Weatherburn, D. (1992a). The relationship between license type and alcohol-related problems attributed to licensed premises in Perth, Western Australia. *Journal of Studies on Alcohol*, 53(5), 495-498.
- Storey, H., Broderick, G. & Hamilton, M. (1988). *Control Act 1987: Review*. Melbourne: State Government of Victoria.
- Wagenaar, A.C. & Holder, H.D. (1996). The scientific process works: Seven replications now show significant wine sales increases after privatization. *Journal of Studies on Alcohol*, 57, 575-576.
- Wagenaar, A.C. & Maybee, R.G. (1986). The minimum legal drinking age in Texas: Effects of increase from 18 to 19. *Journal of Safety Research*, 17, 165-178.
- Wieczorek, W.F. & Coyle, J.J. (1998). Targeting DWI prevention. *Journal of Prevention & Intervention in the Community*, 17, 15-30.

# Prevention of alcohol-related harm: early childhood and adolescent risk and protective factors

Colleen O'Leary, National Expert Advisory Committee on Alcohol, Project Officer

## Introduction

A variety of intervention and prevention strategies in Australia have helped to minimise the harm resulting from alcohol use as described in the accompanying research papers. However, in spite of the efforts of many individuals and organizations, alcohol misuse continues to be a significant concern. New preventive strategies to reduce the health, social, and economic costs related to the misuse of alcohol are needed.

There is an increasing body of knowledge on the powerful impact of the early childhood years on learning, development, health, and psychosocial well being. Research has accurately identified risk and protective factors related to the social and emotional well being of children. These factors ultimately impact on the risk of problem outcomes including alcohol and other drug use/misuse, poor mental health, conduct disorders, and delinquency. Over the past decade, research has identified reliable interventions that can modify these factors in an attempt to improve social and personal health and well being. Yet, Australian research identifying risk and protective factors and evaluating their impact and potential for modification of the use/misuse of alcohol by adolescents is limited.

Generally, interventions aimed at reducing alcohol-related harms in adolescents through modification of risk and protective factors are commenced during the last years of primary school. Interventions conducted earlier in life have not focussed on the outcome of alcohol misuse, but rather target the outcomes of mental health, conduct disorders, delinquency and educational outcomes. In spite of the growing body of knowledge that there is a common causal pathway leading to a number of negative social and emotional outcomes, a coordinated approach to reducing the risk factors and promoting protective factors has not been forthcoming in Australia. Intersectoral collaboration is often fraught with difficulties but the available data identifies the importance of individuals and organisations working together in order to make efficient use of limited resources.

The area of prevention is one that will not provide immediate returns on the investment made today. The long-term nature of these programs and interventions make them difficult to promote to a society which has increasingly grown to expect immediate results. It is important that funding currently directed to the areas for treatment and secondary prevention aimed at achieving more immediate results is not substantially reduced in order to fill the gap in long-term prevention strategies. A mix of well-funded short- and long-term initiatives will have the greatest potential to achieve positive outcomes across society.

This paper has been adapted from a scoping paper written for the National Expert Advisory Committee on Alcohol on early childhood risk and protective factors relating to adolescent alcohol use/misuse. The aims of this paper were to

- identify risk and protective factors shown to be important to early use and misuse of alcohol by adolescents;

- identify and briefly describe other outcome areas with common risk and protective factors;
- identify risk and protective factors relating to early use and misuse of alcohol by Indigenous adolescents and identify culture-specific issues relating to this area;
- identify effective early interventions (conducted prior to the occurrence of adolescent alcohol misuse) to modify risk and protective factors;
- identify work conducted in Australia on risk and protective factors and interventions utilising these factors; and
- identify research gaps and areas for future research and collaboration.

The literature for this paper has been identified through Medline and PsycInfo databases, by reference to relevant articles cited in research papers, through an Internet search and through literature provided by members of the National Expert Advisory Committee on Alcohol.

## Literature review: risk and protective factors

Physical and mental health is inextricably linked. (Raphael et al., 1999) An array of psychosocial and environmental factors is linked to and influences the status of physical and mental health at the population level. These factors include income, employment, poverty, education, access to community resources (Kawachi and Marmot, 1998) (Baum, 1998) and demographic factors including gender, age, and ethnicity. These population level determinants of health translate into risk and protective factors at the individual level which ultimately influence physical and mental health and well being (Rutter, 1985)

Increasingly, the importance of risk and protective factors and the need for early intervention to enhance the well being of children is being recognized. Over recent years, a number of major publications have reviewed factors that increase risk or confer protection to children during their developmental years.

The concept of mechanisms or factors that increase or decrease the social and emotional well being of children has been increasingly researched over the past two decades. A paper by Rutter published in 1987 describes the transition of research focus from one of vulnerability and risk to one of resilience and protective factors or mechanisms. Resilience is described as an individual's response to risk, which is not a fixed attribute but one that alters with changing circumstances. Protective mechanisms are described as countering risk factors and are afforded through the ways in which people deal with life changes. These protective mechanisms result in a reduction of risk impact through processes that include direct effects on the risk, alteration of exposure in the risk, reduction of negative chain reactions, promotion of self-esteem and self-efficacy, and processes, such as education, that open up opportunities. (Rutter, 1987)

In the past, research relating to risk factors has been more extensive than that conducted on protective factors although more recently there has been increased effort to identify factors that promote resilience and protect against risk factors. Identified risk and protective factors include child factors such as temperament, aggressiveness, academic deficits and poor social skills; family factors including parenting practices, inter-parental conflict, family structure and stability, poor parental mental health, social support and isolation, poverty, neighbourhood disorganization, peer influence, and school-related factors such as academic failure (Marshall and Watt, 1999, Karoly et al., 1998, Sanders et al., 2000, Patton, 1999, Kumpfer, 1999, Lambert et al., 1999, Silburn et al., 1996, Sanders, 1995).

The presence of risk factors does not guarantee that the individual will go on to display later problems or dysfunction (Sanders et al., 2000). There is a dynamic interaction among the risk and protective factors that changes throughout life and it is thought that the patterns of interaction are interwoven and complex (Mrazek, 1994). The finding that many health aspects initiated during adolescence continue into adulthood ultimately resulting in disability and mortality reinforces the importance of prevention and early intervention (Patton, 1999).

## Risk and protective factors relating to adolescent alcohol use

Research into risk and protective factors has been conducted in the area of prevention of adolescent alcohol use/misuse over the past two decades. The bulk of this work has been conducted primarily in the United States with Australian interest in the area developing only recently and with relatively little Australian research having been conducted to date. This dearth of Australian research and the differences in attitudes towards alcohol use and harm minimisation between the two nations inhibits the direct translation of overseas research results into Australia and emphasises the need for Australian data. The research conducted does not focus on the relationship between risk and protective factors and different types of alcohol use and harm, such as deliberately drinking to excess (binge drinking), but instead focuses on the commencement of alcohol use. It must be recognised that the interaction between risk and protective factors is likely to vary with the pattern of alcohol use and misuse. The data relating to adolescent alcohol use/misuse reviewed below must therefore be interpreted with caution until Australian data are available.

A 1992 review by Hawkins divided risk-protective factors that precede alcohol and other drug abuse into two broad categories, societal and cultural factors (laws, norms, availability, economic deprivation and neighbourhood disorganization) and individual and interpersonal environments (families, school, and peers) (Hawkins et al., 1992a). A number of risk-protection factors identified as having the potential to be targeted for prevention efforts occur within the heading of interpersonal environments. These involve:

- Family:
  - family modelling of and attitudes towards alcohol use;
  - parenting practices including inconsistent discipline;
  - maternal interaction with children;
  - low parental expectations for achievement;
  - family conflict;
  - low bonding to family; and
  - early and persistent problem behaviours.
- School:
  - academic failure; and
  - a low degree of commitment to school
- Peers:
  - peer rejection; and
  - association with drug using peers.

Positive attitudes towards alcohol and other drugs and the early onset of their use are also reported to be predictors of substance use. Four conclusions regarding risk factors for alcohol and other drug abuse were drawn:

- these factors have been shown to be stable over time;
- they arise from several domains;
- they are salient at different developmental periods; and
- risk increases with the number of risk factors present and their interaction has a multiplicative effect (Hawkins et al., 1992a).

There has been an increasing number of longitudinal and case-control studies focussing on adolescent alcohol consumption since the 1992 review by Hawkins. The outcomes observed have related to parental factors, peer groups, academic achievement, religion and childhood behaviour. The studies

have, with two exceptions from Scandinavia, (Pulkkinen and Pitkanen, 1994, Bergmark and Andersson, 1999) been conducted in the United States (Baumrind, 1991; Johnson and Pandina, 1991; Simons and Robertson, 1989; Wills et al., 1992, Ary et al., 1993; Duncan et al., 1994; Cohen et al., 1994; Bahr et al., 1995; Jessor et al., 1995; O'Donnell et al., 1995; Hawkins et al., 1997; Jackson et al., 1997; Jackson et al., 1998; Bahr et al., 1998; Baer and Bray, 1999; Costa et al., 1999; Donovan et al., 1999; Jackson et al., 1999; Ouellette et al., 1999; Hops et al., 1999; Gerrard et al., 1999; Brody et al., 1999) Sample size is greater than 200 for all but five studies (Simons and Robertson, 1989; Baumrind, 1991; Ary et al., 1993; O'Donnell et al., 1995; Brody et al., 1999).

Many of the studies reviewed discussed the existence of a significant interaction between protective and risk factors with protective factors thought to moderate the impact of risk. (Simons and Robertson, 1989; Wills et al., 1992; Ary et al., 1993; Jessor et al., 1995; Bahr et al., 1995; Costa et al., 1999). Protective factors were found to be of greatest importance when there are a high number of risk factors (Wills et al., 1992; Costa et al., 1999). Influences on drinking are not static but shift as the adolescent matures (Baer and Bray, 1999) and the total number and balance of risk and protective factors account for significant variation in the change in alcohol use over time (Jessor et al., 1995; Costa et al., 1999). It is important to note that a population-based study examining the years 1972-1992 has shown that the psychosocial and behavioural correlates of adolescent drinking have remained stable over time (Donovan et al., 1999).

Over half the papers reviewed assessed parenting style and alcohol use by adolescents and all found an association between the two. Baumrind defined four prototypes of parenting: authoritative - parents are demanding and responsive, setting clear standards; authoritarian - parents are demanding and directive but not responsive; permissive - more responsive than demanding; and rejecting-neglecting - are neither demanding nor responsive. (Baumrind, 1991) Baumrind found that authoritative parenting protected adolescents from problem alcohol and other drug use and generated adolescent competence. When the adolescents studied were 15 years of age, parent types accounted for 27% of the variance in substance use. Jackson et al found a significant reduction in early use with perceived effective parenting among 10 year-old students (Jackson et al., 1997). The same authors found a significant reduction in the use of alcohol by 9-11 year old children who had authoritative parents (Jackson et al., 1998), while in a later study they found the association to be directly related to parental demandingness (Jackson et al., 1999).

A number of studies found an inverse relationship between parent-child relationships and the use of alcohol (Johnson and Pandina, 1991; Wills et al., 1992; Cohen et al., 1994, Jessor et al., 1995; Hawkins et al., 1997; Bahr et al., 1998; Baer and Bray, 1999; Gerrard et al., 1999). Family conflict has been shown to decrease the quality of parent-adolescent communication, increase stress, and increase the use of alcohol by both the adolescent and their peers (Baer and Bray, 1999). Family cohesion and positive parenting were found to protect against an initial and upward trajectory of alcohol use (Duncan et al., 1994), influence the selection of non-alcohol using peers (Simons and Robertson, 1989; Cohen et al., 1994; Bahr et al., 1995; Baer and Bray, 1999), support an acceptance of parental influence on drinking (Gerrard et al., 1999) and a belief in the harmful effects of alcohol use by adolescents (Hawkins et al., 1997). It has been suggested that the influence of family is not linear over time and may be at its lowest point during early adolescence when peer influence is at its peak (Duncan et al., 1994).

### Parental monitoring, modelling, and attitude to alcohol

Parental monitoring and time spent with children have been shown to protect against both alcohol use and disruptive behaviour (Richardson et al., 1989; Cohen et al., 1994) (Steinberg et al., 1994; Jessor et al., 1995), although parental monitoring is thought to be a stronger predictor of alcohol use than self-care (Cohen et al., 1994). Parental monitoring has been shown to have a greater impact on girls than boys and in the case of current alcohol users an increase in parental monitoring can decrease drug use (Steinberg et al., 1994). A recent study found that inadequate monitoring increases the odds of alcohol use in 5th-7th grade students to 2.62 (Jackson et al., 1999).

The role of parental modelling on the use of alcohol by adolescents shows some variation between studies. Overall, the studies support an association between these factors (Johnson and Pandina, 1991; Pulkkinen and Pitkanen, 1994; Hawkins et al., 1997; Jackson et al., 1997; Bahr et al., 1998; Ouellette

et al., 1999) through positive effects on adolescent alcohol expectancies and attitudes (Hawkins et al., 1997; Ouellette et al., 1999), peer selection and alcohol use (Bahr et al., 1998; Hawkins et al., 1997) and on male offspring's drinking as adults (Pulkkinen and Pitkanen, 1994). A cross-sectional survey conducted by Jackson (Jackson et al., 1997) found frequent parental drinking significantly increased the odds of alcohol use by 2.9, a finding not supported by the results of their longitudinal study published two years later which found a non-significant increase in odds of 1.95 (Jackson et al., 1999). The lack of significance in this latter finding however may be due to the high loss to follow-up (38%) in this study. Although an early case-control study found no influence of parental alcohol use on adolescent use the numbers of cases and controls were small (<200) and selection of controls is often subject to bias (Simons and Robertson, 1989). Parental tolerance or approval of alcohol use on the other hand was positively associated with adolescent drinking by all studies examining this factor (Johnson and Pandina, 1991; Ary et al., 1993; Donovan et al., 1999; Gerrard et al., 1999; Jackson et al., 1999).

### Peer group

Peer pressure is considered by some investigators to be the most powerful risk factor for alcohol use and other problem behaviours (Jessor et al., 1995). Peer alcohol use has been shown to be positively associated with adolescent use (Donovan et al., 1999; Wills et al., 1992; Ary et al., 1993; Duncan et al., 1994; Bergmark and Andersson, 1999; Ouellette et al., 1999), while early exposure to peers who use alcohol results in early adolescent and increased problem alcohol use (Hops et al., 1999; Costa et al., 1999). Continued peer influence helps to maintain subsequent alcohol use (Duncan et al., 1994) and attenuates parental influence regarding drinking (Gerrard et al., 1999). O'Donnell et al investigated a sub-sample of 10-year-old boys who had been identified as aggressive in their longitudinal study (O'Donnell et al., 1995). They found that by 13-14 years of age, the aggressive boys who had become involved in alcohol use had an increased level of negative peer interaction compared to those uninvolved with alcohol. It should be noted that the sub-sample was composed of a small number of boys.

### Academic achievement

School adaptation and academic problems during primary school (grades 2-6)(Pulkkinen and Pitkanen, 1994; Jackson et al., 1997; Bergmark and Andersson, 1999; Hops et al., 1999) and during teenage years (Wills et al., 1992; Pulkkinen and Pitkanen, 1994; Jessor et al., 1995; Donovan et al., 1999) have been shown to be risk factors for alcohol use during adolescence. Positive orientation to school has been found to protect against alcohol use in longitudinal studies of students in high school (Jessor et al., 1995; Costa et al., 1999) and in the sub-sample of aggressive boys in the study by O'Donnell (O'Donnell et al., 1995).

### Religion

Religious beliefs and attendance have been shown to protect against both alcohol use and misuse in a longitudinal study (Jessor et al., 1995), a population-based study (Donovan et al., 1999), and a cross-sectional study (Bahr et al., 1998). The finding that parent-adolescent bonds indirectly affect alcohol use through religion may not be generalisable to the wider population in the cross-sectional study by Bahr (Bahr et al., 1998). This study was conducted in Utah where around 69% of the population are members of the Mormon Church (Bahr et al., 1998).

### Child and Adolescent Behaviour and Attitudes

The transition from primary to high school is associated with a rapid increase in alcohol use (Duncan et al., 1994) suggesting that predisposing factors are established by the end of primary school and that interventions should be implemented early (Ouellette et al., 1999). Social and behavioural problems at 7-11 years of age have been shown to increase the risk of deviant alcohol use (Wills et al., 1992; Cohen et al., 1994; Pulkkinen and Pitkanen, 1994; Jackson et al., 1997; Hops et al., 1999; Bergmark and Andersson, 1999), and that as early as grade 3 teachers are aware of emerging problems, particularly relating to boys (Bergmark and Andersson, 1999). Negative child and adolescent attitudes to alcohol use and expectancies, intolerance of deviance, and prosocial involvement all offer protection against early

alcohol initiation and excessive or frequent alcohol consumption (Jessor et al., 1995; O'Donnell et al., 1995; Hawkins et al., 1997; Costa et al., 1999).

### Common Causal Pathways

Research into risk and protective factors has also been conducted in the areas of mental health, behaviour problems and conduct disorders, and antisocial and criminal behaviour. A number of recent reports have looked at risk and protective factors for specific outcomes including child behaviour problems (Marshall and Watt, 1999; Karoly et al., 1998; Sanders et al., 2000), crime and delinquency (Homel et al., 1999; Kumpfer, 1999; Karoly et al., 1998), adolescent health (Patton, 1999), family and parenting (Lambert et al., 1999), perinatal mental health (Kowalenko et al., 2000) and mental health (Silburn et al., 1996; Sanders, 1995). Although each report approached the topic focussing on different outcomes, similar underlying causes and common risk factors have been identified across the spectrum of outcomes. Therefore, it is likely that efforts to reduce problems in one area through focussing on risk/protective factors will also have an effect on other child and adolescent problem behaviours (Hawkins et al., 1992a; Patton, 1999; Homel et al., 1999).

Table 1 presents the relationship between the risk and protective factors identified for adolescent alcohol use/misuse and the outcomes of mental health, behaviour problems & conduct disorders, and antisocial & criminal behaviour. It should be noted that this is not a comprehensive list of identified risk and protective factors for the outcomes but aims to show the relationship between the four areas. The table clearly shows that there a number of risk and protective factors common to all four areas. These areas of commonality present the opportunity for researchers across a number of fields to work together in the field of risk and protective factors and prevention.

### Mental Health

Transitional life stages are periods of increased vulnerability for both parents and children. The perinatal stage encompassing pregnancy, birth, and the first two-years postpartum is a time of increased risk to parental and infant mental health and well being, healthy parenting, and family functioning. A child's physical and emotional development requires positive maternal and child interactions, physical and emotional nourishment, love, security, protection, positive learning and socialisation (Kowalenko et al., 2000). Poor parental mental health has a strong and complex association with child health (Beck, 1998) and social problems. Parenting factors feature strongly as risk and protective factors for the development of the four outcomes reviewed in Table 1, a relationship that emphasizes the importance of prevention in the areas of mental health and parenting as early as the perinatal period.

Risk factors for perinatal mental health problems have been divided into two main groups. The key risk factors have an independent relationship with perinatal mood disorders and include prolonged psychosocial adversity, history of and current depression, lack of available confidante and unwanted pregnancy (Kowalenko et al., 2000). The risk factors in the second group are lacking strong evidence to support an independent relationship but may be related through the key risk factors and include drug and alcohol abuse, relationship problems and social stressors including financial strain and unemployment (Kowalenko et al., 2000). There has been limited research on protective factors but those identified to date are broadly the converse of the identified risk factors although this is not always the case.

It is recognised that a poorer outcome is seen in people with co-occurrence of mental health disorders and alcohol and other drug use disorders than in people with a single disorder (Teeson, 2000). People with comorbidity are "more impaired, suffer greater social disability and generate larger social costs" (page 9) (Hall et al., 2000). Childhood and adolescence are the critical times for the development of emotional and alcohol and other drug problems. The occurrence of childhood anxiety problems can lead to adolescent depression and ultimately to substance use disorder in an attempt to alleviate the anxious-depressive symptoms (Dadds, 2000). The incidence of substance use disorder is estimated to increase three-fold in people with emotional problems (Dadds, 2000) and "comorbidity is the rule rather than the exception with mental disorders" (page 8) (Hall et al., 2000). Studies targeting social

skills and psychological skills training in pre-adolescents and adolescents have proved effective in reducing anxiety problems and depressive symptoms in children. (Dadds et al., 1999; Jaycox et al., 1994; Dadds, 2000). To date though, studies targeting emotional problems in children and adolescents have not assessed whether they do result in an actual reduction of substance use disorders in adolescence. This gap in knowledge has been identified as a research priority by researchers (Dadds, 2000)

**Table 1: Relationship between risk and protective factors for adolescent alcohol use/misuse and mental health, behaviour problems & conduct disorders, and antisocial & criminal behaviour.**

| <b>Risk and Protective Factors</b>  | <b>Adolescent Alcohol Use/Misuse</b> | <b>Mental Health (Davis et al., 2000)</b> | <b>Behaviour Problems &amp; Conduct Disorders (Sanders et al., 2000; Marshall and Watt, 1999)</b>    | <b>Antisocial &amp; Criminal Behaviour (Homel et al., 1999)</b> |
|---|--------------------------------------|---|--|---|
| Parental modelling of and attitude to alcohol                             | ✓                                    |   |  |   |
| Parental monitoring   | ✓                                    |   |  |   |
| Parental discipline style   | ✓                                    | ✓   | ✓  | ✓   |
| Family conflict   | ✓                                    | ✓   | ✓  | ✓   |
| Low bonding to parents and lack of parental involvement or responsiveness | ✓                                    | ✓   | ✓  | ✓   |
| Early and persistent behaviour problems                                   | ✓                                    |   |  | ✓   |
| Peer rejection and/or poor social skills                                  | ✓                                    | ✓   | ✓  | ✓   |
| Deviant peer group  | ✓                                    |   |  | ✓   |
| Poor academic achievement   | ✓                                    |   | Evidence unclear as to whether academic failure precedes or follows development of conduct disorders | ✓   |
| Poor school orientation   | ✓                                    |   |  | ✓   |
| School transition or change   | ✓                                    | ✓   |  |   |
| Social & behavioural problems in preschool & primary school               | ✓                                    |   |  | ✓   |

## Behaviour problems and conduct disorders

Conduct disorders including oppositional behaviours, aggressive behaviours, and delinquent acts, can lead to serious short- and long-term problems. (Sanders et al., 2000) Long-term problems of personality disorder include poor marital, social and occupational adjustment (Kazdin, 1987), adult personality disorder, alcohol abuse, and other psychiatric disorders (Rutter, 1989).

Child conduct problems involve significant comorbidity with family factors, the school system, peers and academic failure each contributing to child psychosocial problems (Sanders et al., 2000). Clinical treatment is thought to be unlikely to markedly reduce the burden from behaviour problems and therefore a combination of universal, selected, and indicated preventive strategies should be implemented to complement clinical programs. Family-based interventions have been found to be effective with children from birth to 5 years while older children with identified problems require a broader range of interventions (Marshall and Watt, 1999). It is likely therefore that the greatest impact on child conduct problems will occur from interventions conducted in early childhood and early primary school (Sanders et al., 2000).

## Australian data

A comprehensive assessment of the range of risk and protective factors predicting common psychosocial health problems and licit and illicit substance use in young people was assessed through The Adolescent Health and Well Being Survey (Bond et al., 2000). This survey, conducted by the Centre for Adolescent Health in Victoria, surveyed year 7,9, and 11 students enrolled in 150 metropolitan and 60 non-metropolitan schools (n= 8,984; 70% response rate).

There was a definite association between the number of risk and protective factors and the outcomes under investigation. For alcohol, 79% of those with 10 or more elevated risk factors consumed alcohol in the past month as opposed to 13.9% of those with 0 to 1 elevated risk factors. The presence of 2 to 3 elevated protective factors reduced the risk of using alcohol, tobacco, marijuana or other drugs by 50% and 4 or more elevated protective factors further reduced this risk. Problems with mood (i.e. depression), deliberate self-harm, risk of homelessness or sexual activity were seen in adolescents with more elevated risk or fewer elevated protective factors.

The Adolescent Health and Well Being Survey has provided base-line data of risk and protective factors and problem behaviours within Victoria. Follow-up surveys may be required to ensure the accuracy and validity of this data as well as tracking changes in these factors over time. This information has the potential to assist policy makers in directing service provision and interventions, evaluating the impact of community changes and government initiatives and monitoring trends in factors over time. For future studies, the inclusion of questions evaluating the pattern of drinking would provide useful information for evaluation of the trends and extent of harms relating to the use/misuse of alcohol by adolescents.

Similar data has also been collected in Western Australia (WA) through the WA Child Health Survey which collected data on adolescents 12-16 years of age, their parents, and teachers. Although not collected primarily for this purpose, this data provides the opportunity to look at risk and protective factors shown by overseas research to influence adolescent alcohol use/misuse. It is important that this data is not under-utilised through lack of funding or knowledge of its existence and that collaboration in the analysis of this data set, and others like it, should have a more coordinated approach.

## Risk and protective factors relating to adolescent alcohol use: Indigenous Australian data

The limited array of literature addressing the issue of prevention and early intervention for Aborigines, their children, and youth comes primarily from the area of mental health and portrays a pessimistic picture of the current situation (Hunter, 1995b; Hunter, 1995a; Hunter, 1998; Merritt, 1999). To date, there are few data available on risk and protective factors relating to alcohol use by adolescent

Indigenous Australians. The main body of data has been generated in the Northern Territory under the auspices of the Living With Alcohol Program (Jessen, 1999), although in Western Australia a study designed to identify risk and protective factors in indigenous youth is currently being conducted by Dr. Steve Zubrick (Zubrick, 2000). The Western Australian study is well underway, however evaluation and dissemination of the data have not yet commenced.

The pattern of drinking by indigenous youth varies with the community examined but generally, 18-20 year olds and unemployed or underemployed 16-17 year olds are perceived to have a serious drinking problem. In communities maintaining traditional culture, the initiation of 15-16 year old indigenous youth has been identified as a possible risk factor for the occurrence of problem drinking at this age. Initiation is associated with a sense of independence and a reduction in supervision of behaviour including drinking of alcohol. There is concern in some communities that when intoxicated people break traditional rules punishment is not forthcoming, as the individual is not considered responsible for their actions. This results in repetitive anti-social behaviour that continues when the person is sober (Jessen, 1999).

The research carried out in the Northern Territory identified the following risk and protective factors to be influential in the early use and misuse of alcohol by indigenous youth (Jessen, 1999).

Parental attitudes and modelling were found to be significant factors influencing drinking in indigenous adolescents with strictness and positive role modelling being protective of early and excessive alcohol use. Although an unstable family background increases the risk of excess drinking, relatives can counteract or reinforce parental attitudes and modelling. Contrary to the findings for non-indigenous youth, indigenous parental and guardians' influence was found to be more significant than that of peer influence, which appears to be a 'passive' facilitator. This presents the opportunity to revive cultural responsibility for younger relatives/community members as a strategy to prevent early, excessive, and prolonged alcohol use.

The influence of community and social capital on indigenous adolescents' consumption of alcohol was found to be of crucial significance. The most important community factor appeared to be strong leadership and cohesion whether or not traditional culture was present although where traditional culture was strong, adult and adolescent drinking problems were less widespread. Participation in non-traditional religious activities also afforded protection from early and excessive use of alcohol.

Insufficient employment opportunities and a lack of leisure time activities were both found to predict an increase in drinking throughout the community particularly in the 15-17 year olds who have left school. As with non-indigenous youth, positive attitudes to school and identified workforce goals are protective factors.

The effect on alcohol consumption of participation in sport varies depending upon associated factors such as the drinking culture surrounding some team sports or an ambition to compete at an elite level. When combined with positive role modelling by senior team members', involvement in sport can inhibit alcohol consumption by youth.

The social and emotional disadvantage experienced by indigenous Australians is enormous. Indigenous Australians encounter multiple risk factors more frequently than other Australians and the factors leading to an increased risk of poor outcomes cover every aspect of life (Hunter, 1995b). The range of factors include a changing population structure, cultural change, family dysfunction or breakdown, removal of children from their families, poverty, lack of educational opportunities, unemployment, alcohol and other drug misuse, social injustice and racism (Hunter, 1995b; Hunter, 1995a; Merritt, 1999). In many indigenous communities these factors are experienced universally and combine to overburden the population with stress and work to minimise both the development of protective factors and the influence of individual resilience (Hunter, 1995b; Hunter, 1998).

Research conducted overseas has shown that the overwhelming bleakness of situation similar to that experienced by Australian indigenous people can be overcome. A longitudinal study conducted on the Hawaiian Island of Kauai followed the 1955 birth cohort (698 births) over a period of thirty-two years.

The researchers identified a group of 'high-risk' children (n=201) who had experienced four or more of the following risk factors prior to two years of age: perinatal stress, chronic poverty, lack of parental education, family disharmony, divorce, parental alcoholism or mental illness. The study found that poor adaptation was not an inevitable outcome of exposure to risk factors and stressful environments, with a third of the high-risk group developing healthy relationships, personalities, and stable careers in later life (Werner, 1989).

The significant protective factors identified by Werner included a combination of factors arising from the individual, family, and wider social networks (Werner, 1989). One of the most significant factors was dependence on informal sources of support such as family and friends. Maternal employment and responsibility for younger siblings were positive factors for girls while the presence of a male family member able to serve as a (positive) role model promoted resilience in boys. Boys also benefited from structure, rules, and assigned chores as part of the daily routine within the household (Werner, 1989)

Researchers have identified the need for primary prevention and intervention in indigenous people being directed toward children and the family since the risk factors begin early, persist through childhood, are numerous and interacting (Werner, 1989) (Hunter, 1995b). The need to implement strategies to deal with substance abuse in older generations in conjunction with primary prevention has also been acknowledged (Hunter, 1995b). Community support for primary prevention and intervention programs may first require the provision of secondary and tertiary prevention services to deal with the existing mental and physical health problems (Hunter, 1995b). For many Aboriginal people prevention strategies may not be given a high priority when confronted on a daily basis with extreme deprivation and a lack of basic services (Hunter, 1998).

Child raising within Aboriginal society contrasts sharply with the western style of parenting. Child rearing in Aboriginal societies is intertwined with the ideals of indulgence, generosity, autonomy and relatedness. Indulgence is seen to be a right of every child and the duty of every adult, revolving around the notion of relationship and the obligation to share or give to one in need. Generosity is seen as a natural part of life.

Aboriginal children learn the activities and social interactions of their society more from the example of adults and older children, than from verbal explanation or discipline as in western society (Hamilton, 1981). Over recent decades the parenting skills of Aboriginal people have been undermined. The removal of Aboriginal children (of mixed descent) from their parents, relocation of families to missions, the placement of children in dormitories and the use of communal dining rooms took away the opportunity for parents to care and provide for their own children (Hunter, 1995a). The functioning of Aboriginal families has been severely disrupted.

In the pre-adolescent period (commencing around 9 years of age in some regions) the indulgence of childhood ceases and education of Aboriginal societal laws and responsibility occurs (Hamilton, 1981). Hamilton's work was undertaken in Arnhem Land. In other traditionally oriented regions, young people are not 'initiated' (in both religious and secular senses of the term) until much later, around 17 or 18 years of age. In some regions, as a result of deeply embedded social and cultural processes, parents are unwilling or unable to discipline their children and object when others attempt to do so. This affects community attempts to manage outbreaks of substance abuse, particularly in the case of petrol sniffing (Brady, 1992). An understanding of these differences between indigenous and 'western' child socialisation patterns is vital when developing intervention and prevention strategies.

## Early intervention programs

In order to effect a positive change, communities need to implement a number of concurrent interventions using a combination of the three types of strategies starting with universal programs (Offord et al., 1998; Marshall and Watt, 1999) and to target several levels including family, school and community, and individuals (Homel et al., 1999; Lambert et al., 1999). The best, most lasting effects arise from interventions conducted early in the developmental pathways over a period of several years (Homel et al., 1999). Increasing knowledge will require a re-evaluation of the strategies used and changes will need to be implemented where indicated (Offord et al., 1998).

The entry of a child into school provides a key opportunity to implement prevention and intervention strategies to promote the well being of students and their families. Long hours are spent in school providing the setting not only for a child's education but also their social and emotional development (Sanders and Dadds, 1992). This paper will review intervention programs commenced during primary school and designed to reduce alcohol use/misuse by adolescents through modification of risk and protective factors. Studies such as the high school, classroom-based alcohol program (SHAHRP), will not be covered. Discussion of this program can be found in the paper by Midford et al, 'Research priorities for community-based prevention of alcohol-related harm'.

School-based interventions for the prevention of a number of problems including child conduct problems, adolescent alcohol and drug use, and family functioning is an area that needs to be further explored. Although there is a growing body of evidence supporting the effectiveness of a range of school-based interventions the overall impact of some programs has not been fully evaluated to date. A number of problems associated with school-based interventions have been identified including a highly complex intervention strategy, specialist input, and long-term implementation which make these interventions very costly to implement potentially limiting their uptake and effectiveness. However, school-based programs can be designed to avoid these problems and their potential for improving the well being of children is one, which should be fully developed (Sanders et al., 2000).

A prevention approach targeting risk factors can work through two mechanisms, direct manipulation of the risk factors or in the case of non-manipulative factors it may be possible to moderate the effects of the risk factor via protective factors. Hawkins determined that intervention strategies focussing on prevention should target both risk and protective factors and include multiple strategies aimed at a number of factors and involving the areas of health, education and social services. The time frame that should be targeted is the developmental period of the risk factor (Hawkins et al., 1992a). A number of prevention strategies conducted prior to 1992 and focussing on early risk factors for adolescent alcohol use are reviewed by Hawkins and his conclusions are summarized here:

- Early childhood and family support programs:  
Reduce childhood behaviour problems, family management problems, and academic failure through the buffering of the effects of poverty and neighbourhood disorganization.
- Programs for parents of children and adolescents:  
Reduce family management problems and increase family bonding through buffering childhood behaviour problems. Limitations of these studies include non-participation, attrition, and implementation in parenting skills training programs.
- Social competence skills training:  
These approaches have produced varying results although the evidence suggests this strategy is a potential prevention strategy.
- Academic achievement promotion:  
Alterations in teacher's instructional practices and tutoring hold promise for a reduction in academic failure and problem behaviours of children.
- Organizational changes in schools:  
Results of studies show that this approach can reduce both risk factors for alcohol and other drug abuse and drug use itself.
- Youth involvement in alternative activities:  
Results are mixed but some strategies are worth investigating further. It is thought that high sensation activities may replace drugs for adolescents who are risk-takers.
- Comprehensive risk-focused programs:  
Comprehensive programs produced reductions in the incidence of early initiation of drug use and delinquency.

Recent intervention studies aimed to prevent adolescent alcohol uptake and misuse through a reduction of risk factors and an increase of preventive factors are limited in number and have not been

researched in Australia. There have been five studies utilizing a combination of intervention areas identified (Hawkins et al., 1992b; Loveland-Cherry et al., 1999; Spoth et al., 1999; Williams et al., 1999; Kosterman et al., 1997), all of which have been conducted in the United States. Each of the intervention programs were commenced during primary school and focused on parenting and family skills with one study also targeting teaching practices (Hawkins et al., 1992b) and one including a community component (Williams et al., 1999). All of the studies reported significantly lower rates of alcohol initiation and alcohol-related problems (Hawkins et al., 1992b; Loveland-Cherry et al., 1999; Spoth et al., 1999; Williams et al., 1999) with two studies reporting that the greatest impact was found with students who had not used alcohol at baseline (Loveland-Cherry et al., 1999; Williams et al., 1999). The inclusion of teaching practices in the Seattle Social Development Project resulted in an increased attachment to school and a perception of school as more rewarding (Hawkins et al., 1992b).

Positive benefits were also seen in the areas of family management, communication, bonding and a decrease in adolescent-family problems (Hawkins et al., 1992b; Loveland-Cherry et al., 1999; Williams et al., 1999). Lack of parental participation in the programs was found to impact on three studies (Hawkins et al., 1992b; Spoth et al., 1999; Williams et al., 1999). In the Seattle Social Development Project, parenting interventions were taken up by fewer than half of all eligible parents while the teaching component was implemented more thoroughly and consistently. This was reflected in their results where the largest effect sizes were obtained for school constructs (Hawkins et al., 1992b). The importance of family participation was shown in Project Northland where two levels of family intervention were employed. The largest decrease in family problems was seen following the intensive family intervention conducted in the sixth grade where 90% of parents participated in the program and 70% completed the whole program. A less intensive family intervention conducted in the seventh grade was estimated to reach fewer than one half of the parents and did not achieve a significant reduction in family problems (Williams et al., 1999). The Iowa Strengthening Families Program found family participation to impact directly on the results at the end of the first year of the intervention but not after the second year follow-up (Spoth et al., 1999).

## Intersectoral collaboration

The evidence presented above supports the need for a coordinated, intersectoral approach to addressing determinants of adolescent social and emotional health and well being. Unfortunately a number of barriers work to limit a coordinated approach including funding arrangements, parochialism, and existing commitments. In recognition of the need for increased intersectoral collaboration the Population Health Division of the Department of Health and Aged Care recently conducted a workshop to identify strategies for improving collaborative action on adolescent health and well being. The workshop provided the forum for identification of the issues and strategies to overcome the barriers inhibiting collaboration. A number of unique strategies used in the Sure Start (U.K.) program (Glass, 1999) to enhance intersectoral collaboration on a nationwide scale were presented by Mr. Norman Glass.

The Sure Start program is unique in that overall coordination of the project is under the auspices of the Treasury ensuring neutrality between the sectors of Health and Education and continuation of funding when faced with government cutbacks. The funds provided for the project were separate to the core annual budget and dependent upon collaboration between government sectors and enhanced partnerships with non-statutory agencies. Implementation of strategies was based on the theory of 'Tight-Loose' control, which involves government being prescriptive only in regard to outputs while leaving local areas to choose strategies most suitable for their area. This method has the potential to enhance the functioning of programs in a nation as vast and diverse as Australia.

## Implications of the literature – research gaps and priorities

- Research needs to be conducted in Australia to investigate the impact of risk and protective factors on the early uptake and misuse of alcohol by adolescents.
- Currently there are no data from Australian early childhood intervention/prevention studies on risk and protective factors to reduce or delay the initiation of alcohol use and subsequent misuse. The opportunity exists to collaborate with programs targeting other outcomes that currently being conducted as well as to design new intervention programs.
- Research should be undertaken to further knowledge on risk and protective factors and early childhood intervention/prevention studies to reduce or delay the initiation of alcohol use and subsequent misuse in Aboriginal adolescents.
- The observation that risk and protective factors for adolescent alcohol use and misuse appear to be similar for a number of outcomes including child behaviour problems, crime and delinquency, adolescent health and mental health identifies the need for a cooperative, intersectoral approach to research relating to prevention.
- Steps should be implemented to ensure data collected as part of extensive surveys are utilized as fully as possible and analyses not limited by a lack of funding.

## REFERENCES

- Ary DV, Tildesley E, Hops H, Andrews J. The influence of parent, sibling, and peer modeling and attitudes on adolescent use of alcohol. *The international journal of the addictions* 1993;28(9):853-880.
- Baer PE, Bray JH. Adolescent individuation and alcohol use. *J Stud Alcohol* 1999; Supplement No 13:52-62.
- Bahr SJ, Marcos AC, Maughan SL. Family, educational, and peer influences on the alcohol use of female and male adolescents. *J. Stud. Alcohol* 1995;56:457-469.
- Bahr SJ, Maughan SL, Marcos AC, Bingdao L. Family, religiosity, and the risk of adolescent drug use. *Journal of Marriage and the Family* 1998;60(Nov):979-992.
- Baum F. *The new public health - An Australian perspective*. Melbourne: Oxford University Press; 1998.
- Baumrind D. The influence of parenting style on adolescent competence and substance use. *Journal of early adolescence* 1991;11(1):56-95.
- Beck CT. The effects of postpartum depression on child development: a meta-analysis. *Archives Psychiatric Nursing* 1998;12(1):12-20.
- Bergmark KH, Andersson T. The development of advanced drinking habits in adolescence - A longitudinal study. *Substance use & Misuse* 1999;34(2):171-194.
- Bond L, Thomas L, Toumbourou J, Patton G, Catalano R. *Improving the lives of young Victorians in our community: a survey of risk and protective factors*. Melbourne: Centre for Adolescent Health; 2000.
- Brady M. *Heavy metal. The social meaning of petrol sniffing in Australia*. Canberra: Aboriginal Studies Press; 1992.
- Brody GH, Flor DL, Hollett-Wright N, McCoy JK, Donovan J. Parent-child relationships, child temperament profiles and children's alcohol use norms. *J Stud Alcohol* 1999; Supplement No 13:45-51.
- Cohen DA, Richardson J, LaBree L. Parenting behaviours and the onset of smoking and alcohol use: A longitudinal study. *Pediatrics* 1994;94:368-375.
- Costa FM, Jessor R, Turbin MS. Transition into adolescent problem drinking: The role of psychosocial risk and protective factors. *J Stud Alcohol* 1999;60:480-490.

- Dadds MR, Holland DE, Laurens KR, Mullins M, Barrett PM, Spence SH. Early intervention and prevention of anxiety disorders in children: Results at 2-year follow-up. *Journal of Consulting and Clinical Psychology* 1999;67(1):145-150.
- Dadds MR. *Comorbidity in mental health and substance use: Causes, prevention and treatment. Prevention and Comorbidity*. National Workshop Report. Brisbane: Griffith University; 2000 March, 2000.
- Davis C, Martin G, Kosky R, O'Hanlon A. Early intervention in the mental health of young people. A literature review. Adelaide: Mental Health Branch, Department of Health and Aged Care; 2000.
- Donovan JE, Jessor R, Costa FM. Adolescent problem drinking: stability of psychosocial and behavioral correlates across a generation. *J. Stud. Alcohol* 1999;60:352-361.
- Duncan TE, Duncan SC, Hops H. The effects of family cohesiveness and peer encouragement on the development of adolescent alcohol use: A cohort-sequential approach to the analysis of longitudinal data. *J Stud Alcohol* 1994;55:588-599.
- Gerrard M, Gibbons FX, Zhao L, Russell DW, Reis-Bergan M. The effect of peers' alcohol consumption on parental influence: A cognitive mediational model. *J Stud Alcohol* 1999; Supplement No 13:32-44.
- Glass N. Sure Start: The development of an early intervention programme for young children in the United Kingdom. *Children & Society* 1999;13:257-264.
- Hall W, Lynskey M, Teeson M. *Comorbidity in mental health and substance use: Causes, prevention and treatment. What is comorbidity and why does it matter?* National Workshop Report. Sydney: National Drug and Alcohol Research Centre
- Hamilton A. Nature and Nurture. *Aboriginal child rearing in North-Central Arnhem Land*. Canberra: Australian Institute of Aboriginal Studies; 1981.
- Hawkins JD, Catalano RF, Miller JY. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. *Psychological Bulletin* 1992;112(1):64-105.
- Hawkins JD, Catalano RF, Morrison DM, O'Donnell J, Abbott RD, Day LE. The Seattle Social Development Project: Effects of the first four years on protective factors and problem behaviors. In: Tremblay JMARE, editor. *Preventing Antisocial Behavior*. New York/ London: The Guilford Press; 1992. p. 139-161.
- Hawkins JD, Graham JW, Maguin E, Abbott R, Hill KG, Catalano RF. Exploring the effects of age of alcohol use initiation and psychosocial risk factors on subsequent alcohol misuse. *J Stud Alcohol* 1997;58:280-290.
- Homel R, Brown M, Putt J, Simmons K. *Pathways to Prevention*. National Crime Prevention. Canberra: Attorney-General's Department; 1999 January 1999. Report No.: Summary Volume.
- Hops H, Davis B, Lewin LM. The development of alcohol and other substance use: A gender study of family and peer context. *J Stud Alcohol* 1999; Supplement No 13:22-31.
- Hunter E. "Freedom's just another word": Aboriginal youth and mental health. *Australian and New Zealand Journal of Psychiatry* 1995;28:374-384.
- Hunter E. Early intervention for indigenous social and emotional health problems. In: 5 ed: *AusEinet*; 1998.
- Hunter E. Is there a role for prevention in Aboriginal mental health? *Australian Journal of Public Health* 1995;19:573-579.
- Jackson C, Henriksen L, Dickinson D, Levine DW. The early use of alcohol and tobacco: Its relation to children's competence and parents' behaviour. *Am J Public Health* 1997;87(3):359-364.
- Jackson C, Henriksen L, Dickinson D. Alcohol-specific socialization, parenting behaviours, and alcohol use by children. *J Stud Alcohol* 1999;60:362-367.

- Jackson C, Henriksen L, Foshee VA. The authoritative parenting index: predicting health risk behaviors among children and adolescents. *Health education and behavior* 1998;25(3):319-337.
- Jaycox L, Reivich K, Gillham J, Seligman M. Prevention of depressive symptoms in school children. *Behaviour Research and Therapy* 1994;32(8):801-816.
- Jessen J. *Underage drinking amongst Indigenous youth in the Northern Territory: Summary Paper*. Summary Report. Darwin, Northern Territory: Northern Territory University; 1999 December 1999.
- Jessor R, VanDenBos J, Vanderryn J, Costa FM, Turbin MS. Protective factors in adolescent problem behaviour: Moderator effects and developmental change. *Developmental psychology* 1995;31(6):923-933.
- Johnson V, Pandina RJ. Effects of the family environment on adolescent substance use, delinquency, and coping styles. *Am J Dru Alcohol Abuse* 1991;17(1):71-88.
- Karoly LA, Greenwood PW, Everingham SS, Hoube J, Kilburn MR, Rydell CP, et al. *Investing in our children: What we know and don't know about the costs and benefits of early childhood interventions*. USA: RAND; 1998.
- Kawachi I, Marmot MG. Commentary: what we can learn from studies of occupational class and cardiovascular disease. *American Journal of Epidemiology* 1998;148(2):160-163.
- Kazdin AE. Treatment of antisocial behavior disorders in children: Current status and future directions. *Psychological Bulletin* 1987;102:187-203.
- Kosterman R, Hawkins JD, Spoth R, Haggerty KP, Zhu K. Effects of a preventive parent-training intervention on observed family interactions: Proximal outcomes from preparing for the drug free years. *Journal of Community Psychology* 1997;25(4):337-352.
- Kowalenko N, Barnett B, Fowler C, Matthey S. *The perinatal period: Early interventions for mental health*. Adelaide: The Australian Early Intervention Network for Mental Health in Young People; 2000.
- Kumpfer KL. *Strengthening America's families: Exemplary parenting and family strategies for delinquency prevention*. Utah: Office of Juvenile Justice and Delinquency Prevention, U.S. Department of Justice; 1999 April 1999.
- Lambert V, Zubrick SR, Silburn SR. *Prevention and intervention in parenting: A policy and literature review. Reviewing the evidence*. Perth, Western Australia: Family and Children's Services; 1999 October 1999.
- Loveland-Cherry LJ, Thomson-Ross L, Kaufman SR. Effects of a home-based family intervention on adolescent alcohol use and misuse. *J Stud Alcohol* 1999;13(Supplement):94-102.
- Marshall J, Watt P. *Child Behaviour Problems. A literature review of its size and nature and prevention interventions*. Perth, Western Australia: The Interagency Committee on Children's Futures; 1999.
- Merritt S. *Indigenous health and early intervention - Addressing and acknowledging the influences of the past*. In: 8 ed: AusEinet; 1999.
- Mrazek PJ, (Eds) RJH. *Reducing risks for mental disorders. Frontiers for preventive intervention research*. Washington DC: National Academy Press; 1994.
- O'Donnell J, Hawkins JD, Abbott RD. Predicting serious delinquency and substance use among aggressive boys. *Journal of Consulting and Clinical Psychology* 1995;63(4):529-537.
- Offord DR, Kraemer HC, Kazdin AE, Jensen PS, Harrington R. Lowering the burden of suffering from child psychiatric disorder: Trade-offs among clinical, targeted, and universal interventions. *J Am Acad Child Adolesc Psychiatry* 1998;37(7):686-694.
- Ouellette JA, Gerrard M, Gibbons FX, Reis-Bergan M. Parents, peers, and prototypes: Antecedents of adolescent alcohol expectancies, alcohol consumption, and alcohol-related life problems in rural youth. *Psychology of Addictive Behaviours* 1999;13(3):183-197.
- Patton G. *The scope for youth health development*. Briefing Paper. Melbourne: The Public Health Partnership; 1999 November 1999.

- Pulkkinen L, Pitkanen T. A prospective study of the precursors to problem drinking in young adulthood. *J Stud Alcohol* 1994;55:578-587.
- Raphael B, Lange D, et al. *Mental health promotion and prevention national action plan*. Canberra: Commonwealth Department of Health and Aged Care; 1999.
- Richardson JL, Dwyer K, McGuigan K, Hansen WB, Dent C, Johnson CA, et al. Substance use among eighth-grade students who take care of themselves after school. *Pediatrics* 1989;84(3):556-566.
- Rutter M. Pathways from childhood to adulthood. *Journal of Child Psychology and Psychiatry* 1989;30:23-51.
- Rutter M. Psychosocial resilience and protective mechanisms. *Amer. J. Orthopsychiat* 1987;57(3):316-331.
- Rutter M. Resilience in the face of adversity: protective factors and resistance to psychiatric disorders. *British Journal of Psychiatry* 1985;147:598-611.
- Sanders M. *Healthy families, Healthy nation. Strategies for promoting family mental health in Australia*. Brisbane: Australian Academic Press; 1995.
- Sanders MR, Dadds MR. Children's and parent's cognitions about family interaction: An evaluation of video-mediated recall and thought listing procedures in the assessment of conduct-disordered children. *Journal of Clinical Child Psychology* 1992;21:371-379.
- Sanders MR, Gooley S, Nicholson J. *Early intervention in conduct problems in children*. Adelaide: The Australian Early Intervention Network for Mental Health in Young People; 2000.
- Silburn SR, Zubrick SR, Garton A, Gurrin L, Burton P, Dalby R, et al. *Western Australian Child Health Survey: family and community health*. Perth, Western Australian: Australian Bureau of Statistics and the TVW Telethon Institute for Child Health Research; 1996. Report No.: Cat. No. 4304.5.
- Simons RL, Robertson JF. The impact of parenting factors, deviant peers, and coping style upon adolescent drug use. *Family relations* 1989;38:273-281.
- Spoth R, Redmond C, Lepper H. Alcohol initiation outcomes of universal family-focused preventive interventions: One- and Two-Year follow-ups of a controlled study. *J Stud Alcohol* 1999;13(Supplement):103-111.
- Steinberg L, Fletcher A, Darling N. Parental monitoring and peer influences on adolescent substance use. *Pediatrics* 1994;93(6):1060-1064.
- Teeson M. Comorbidity in mental health and substance use: Causes, prevention and treatment. Background paper. National Workshop Report. Sydney: National Drug and Alcohol Research Centre University of New South Wales; 2000 March 2000.
- Werner EE. Children of the garden island. *Scientific American* 1989(April):76-81.
- Williams CL, Perry CL, Farbaksh K. Project Northland: Comprehensive alcohol use prevention for young adolescents, their parents, schools, peers and communities. *J Stud Alcohol* 1999;13(Supplement):112-124.
- Wills TA, Vaccaro D, McNamara G. The role of life events, family support, and competence in adolescent substance use: A test of vulnerability and protective factors. *American Journal of Community Psychology* 1992;20(3):349-374.
- Zubrick S. In: *Institute of Child Health Research*, 2000.