Alcohol Consumption in Australia: Can Awareness about Health Impacts, or the Presence of Children in the Home be Linked to Drinking Behaviour?

Jacqueline Bowden

BA(Hons), MPH

School of Psychology, University of Adelaide

Australia

A thesis submitted for the degree of Doctor of Philosophy

February, 2019

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THESIS ABSTRACT

Alcohol consumption is commonplace in Australia and its use is linked to approximately 5,500 deaths per annum. Despite findings that the majority of harms are due to long-term consumption, interventions have predominantly focussed on reducing short-term harms. The Transtheoretical Model (Prochaska & DiClemente, 1982) suggests that behaviour change requires recognition and contemplation of the impact of a behaviour on valued health outcomes. This thesis examines the level of community awareness about the *long-term* harms of consumption, for the self and for children and adolescents, as a first step to the design of behaviour change interventions.

The first study surveyed approximately 2,700 adults each wave in 2004, 2006, 2008, 2010, 2011 and 2012. In 2011/12, 33.0% of men and 10.7% of women drank in excess of the Australian alcohol guideline threshold for increased lifetime risk of disease. Overall, 53.5% correctly recalled the guideline threshold for women; only 20.3% did so for men with 39.0% nominating a higher amount. In 2012, only 36.6% saw alcohol as an important risk factor for cancer (an increase from 22.4% in 2004), but those that did, were less likely to exceed the guideline for increased lifetime risk.

The second study surveyed 2,885 school students aged 12-17 years. Overall, awareness of the link between alcohol and cancer was low (28.5%). Smoking and friends' approval were predictive of drinking, whereas parental disapproval was protective. Those aged 14-17 years who did not think the link between alcohol and cancer was important were more likely to drink. Smoking and the perception that alcohol was easy to buy predicted recent drinking.

The third study utilised data from a national survey of adults aged 25-55 years (n=11,591). Overall, fewer parents exceeded guidelines for increased short-term or lifetime

risk than non-parents. Mothers were less likely to exceed the guideline for long-term risk when their youngest child was aged 0-2, 6-11 or 15 years and over, or the guideline for short-term risk, if their youngest child was aged 0-2 or 15 years and over. Fathers were less likely to exceed the guideline for increased short-term risk if their youngest child was aged 0-2 years. Parents were more likely to drink in the home than non-parents.

The fourth study surveyed 1,000 adults including 670 parents. Respondents were less concerned about a father drinking one or two drinks in front of their children than a mother. Overall, 37.3% of parents reported drinking a glass of alcohol each day or a couple of times a week; 20.1% reported getting slightly drunk; and 8.6% reported getting visibly drunk with their children present. Fathers were more likely to drink, and drink more regularly in front of children than mothers.

These studies highlight that men, in particular, drink in excess of the guideline for increased lifetime risk, and that they are unlikely to be aware of this risk. Furthermore, this over-consumption risks normalising over-consumption for the next generation, particularly given the importance of role-modelling. Communication of these long-term risks is likely to increase awareness, a necessary precursor to behaviour change.

THESIS DECLARATION

I, Jacqueline Bowden, certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree. I acknowledge that copyright of published works contained within this thesis resides with the copyright holder(s) of those works.

I also give permission for the digital version of my thesis to be made available on the web, via the University's digital research repository, the Library Search and also through web search engines, unless permission has been granted by the University to restrict access for a period of time.

I acknowledge the support I have received for my research through the provision of an Australian Government Research Training Program Scholarship.

Published works

Chapter 2: Paper one

Bowden J, Delfabbro P, Room R, Miller C, Wilson C. (2014). Alcohol consumption and NHMRC guidelines: has the message got out, are people conforming and are they aware that alcohol causes cancer? *Australian New Zealand Journal of Public Health,* 38(1), 66-72.

***Note: 34 citations (Google Scholar, accessed on 25 August 2018)*

Chapter 3: Paper two

Bowden J, Delfabbro P, Room R, Miller C, Wilson C. (2017). Prevalence, perceptions and predictors of alcohol consumption and abstinence among South Australian school students: a cross-sectional analysis. *BMC Public Health*, 17, 549-559.

*** Note: Altmetrics score of 152 (top 5% of Altmetrics scores worldwide)*

Chapter 4: Paper three

Bowden J, Delfabbro P, Room R, Miller C, Wilson C. (2017). Parental Drinking in Australia: Does the age of children in the home matter? *Drug and Alcohol Review*. Nov 2018. E Pub ahead of print.

In addition, findings from this thesis have been presented orally at 6 conferences and in a poster format at 1 conference (see Appendix A). Furthermore, findings have generated over 180 national and international media items including syndication[1] (see Appendix B for a sample of media coverage). A piece was also written for *The Conversation* (see Appendix C).

Jacqueline Anne Bowden

21 February 2019

[1] Provided by University of Adelaide Media Department on 21 July 2017.

ACKNOWLEDGEMENTS

There are many people I would like to acknowledge and thank for their contribution to my efforts in producing this thesis.

First and foremost, I am profoundly grateful to my supervisors, Professor Carlene Wilson, Professor Robin Room, Associate Professor Caroline Miller and Professor Paul Delfabbro. Your support, guidance and enthusiasm has been invaluable. Thank you all for the expertise that you have brought, and the time that you have dedicated to me and to this work, when time is precious.

I would like to thank Simone Cormack, previous State Director; Marina Bowshall, State Director; and Richard Cooke, Manager of Population Health, at Drug and Alcohol Services South Australia for providing invaluable advice at study conceptualisation and throughout to ensure that this work has implications for policy and practice.

I am also so grateful for the financial support and data access by Cancer Council South Australia, the South Australian Health and Medical Research Institute, Drug and Alcohol Services South Australia and the Australian Institute of Health and Welfare via the Australian Data Archive. Thank you also to Jason Dunstone and the team at Square Holes for providing me with a discounted quotation for the implementation of my final study.

I will be forever grateful to my team at South Australian Health and Medical Research Institute for the friendship, support, enthusiasm, advice and encouragement while I have embarked on this journey. Sincere thanks to Katrina Douglas for her valuable assistance in proof-reading.

I would also like to thank my Mum, Dad and Sister for helping me to become the person that I am today, for helping me to believe that with hard-work and dedication, the possibilities are endless. To my family more broadly including my Mother and Father-in-Law, your love, moral support, interest and practical assistance with childcare, have helped keep

me focussed and on track in all things, including this thesis. Also, to my friends, thank you for the years of support, encouragement and for being so understanding when I haven't had time to see you. I hope to have a lot more time now!

Finally, I also want to thank my own little family, who have grown considerably throughout my candidature from a lovely family of three (my wonderful, supportive husband Gary and loyal dog Peppa), to now including two beautiful and growing girls Anneliese and Eve. Girls, I hope that I have made you proud and I hope that this will inspire you to do anything you set your mind to.

And now it is time for me to hand over this baby that has been such a big part of my life over the years, you were endless amounts of hard work and you will certainly not be forgotten!

THESIS OUTLINE

Alcohol research and interventions have traditionally focussed on the short-term harms of drinking and alcoholism, but much of the burden is due to long-term health effects of consumption on non-communicable diseases including cancer. Despite the growing international recognition of these links, much less is known in Australia about community understanding of alcohol risks and whether improving peoples' knowledge might motivate people to reduce their alcohol consumption to safer levels.

The primary aims of the first of the four studies in this thesis were to investigate: 1) the extent to which Australian consumption patterns comply with the Australian alcohol guideline to reduce lifetime risk of disease; 2) how compliance relates to awareness of the guideline; and c) perceptions of the importance of alcohol as a risk factor for cancer and how this relates to compliance (Chapter 2).

Knowledge of the relationship between alcohol consumption and cancer was further examined in a representative sample of school-aged Australians. Study two aimed to: 1) confirm documented prevalence of alcohol consumption among school students; 2) examine perceptions of the importance of alcohol as a risk factor for cancer; and 3) examine the influence of perceived parental disapproval and peer approval on consumption (Chapter 3).

A motivating factor to reducing long-term parental consumption may also be highlighting the flow-on effects to children. Consequently, study three assessed: 1) alcohol consumption patterns among parents; 2) places where alcohol is consumed by parents; and 3) how these vary by age of the youngest child in the household. Results indicate variations by age of youngest child, which were further investigated in study four (Chapter 5). In this final study of the thesis, data were collected to describe levels of drinking in front of the child by gender of the parent and how these correlated with descriptive and injunctive norms for drinking at different levels in front of children.

Chapter 1 provides an introduction to drinking culture in Australia, consumption patterns and harms, and provides a supporting argument for the studies in this thesis along with the study aims. Chapters 2 to 5 are reproductions of four cross-sectional studies and Chapter 6 draws the findings together with implications for practice and recommendations for further research.

CHAPTER 1: INTRODUCTION AND LITERATURE REVIEW

1.1 Preamble

This introductory chapter summarises the place of alcohol in the Australian culture, consumption patterns in Australia, and impacts of consumption at the individual and societal levels. It then describes existing research on the role of knowledge and education, community perceptions of the link between alcohol and cancer, the development of alcohol consumption behaviour and the remaining knowledge gaps. It concludes by proposing a shift away from a public health focus on short-term to long-term harms. The thesis aims are outlined within the context of this literature, utilising Bronfenbrenner's Ecological System Theory (Bronfenbrenner, 1979) to highlight the system-based nature of the challenge.

1.2 The cultural prominence of alcohol in Australia

Alcohol consumption in Australia is culturally normative, with 3 in 4 Australians over the age of 14 years consuming at least one drink in the past year (Australian Institute of Health and Welfare, 2017). Adults aged 18 years and over can legally purchase alcohol and its consumption is socially sanctioned and widely promoted in Australia (Roche et al., 2009). People use alcohol for a range of reasons. Motivations to consume include: for relaxation, for enjoyment, to relieve boredom, as a habit, for "self-medication", in response to an addiction, and to overcome social inhibitions (Roche et al., 2009). Consumption is so normalised that, in Australia, a semi-structured interview study of adults aged 25-65 years found that abstinence can be viewed as socially unacceptable (Bartram, Eliott, Hanson-Easey, & Crabb, 2017). Furthermore, drinking is enmeshed with cultural traditions and celebrations and is so common and accepted that people tend to underestimate its detrimental effects. In fact, Australians are more likely to consider illicit drugs as causing more concern to the general community than

alcohol (40% vs 28%) (Australian Institute of Health and Welfare, 2017). By contrast, when all the physical, psychological and social harms to both the user (and to others) of 20 drugs, both licit and illicit, were compared by an independent panel of scientists, alcohol was determined to be the most harmful drug overall (Nutt, King, & Phillips, 2010). The harms of alcohol have also been acknowledged in Australia by the Australian Medical Association who has recently called "for governments to focus on those dependences and addictions causing the greatest levels of harm to individuals and society… this includes alcohol" (Australian Medical Association, 2017, page 1).

1.3 Alcohol consumption in Australia: The size of the problem

By international standards, Australia ranks in the top 20 countries for alcohol consumption. The World Health Organization has estimated that globally, individuals aged over 15 years consume 6.2 litres of pure alcohol, on average, per year. By contrast Australians consume 12.2 litres on average per year (World Health Organization, 2018a). Alcohol is the most widely used drug in Australia (Australian Institute of Health and Welfare, 2017). Based on Australian drinking guidelines, most Australians do not drink at levels that put them at risk of alcohol-related disease or injury, and in the past 3 years, the proportion of people putting themselves at risk of disease has declined. Nonetheless, National Drug Strategy Household Survey (NDSHS) data reveal that it is still the case that in 2016, 17.1% of Australian's aged 14 years and over drank at levels that put them *at increased risk of disease or injury throughout their lifetime* and each month 26% drank at levels that put them *at increased risk of harm on a single occasion*. It is important to note that the NDSHS only accounts for approximately 40-60% of alcohol sales in Australia, whereas the International Alcohol Control (IAC) study accounts for 86% of sales. This IAC methodology yields a higher figure of 27.6% of Australians who drink in excess of the guideline putting themselves *at increased*

risk of disease or injury throughout their lifetime in 2013 (short-term guidelines were not assessed) (Callinan, Livingston, Room, & Dietze, 2016).

Beer is the predominant drink of choice for adult men and wine is the most popular drink for adult women. The most popular choice for adolescents aged between 12 and 17 years old is pre-mixed spirits (Australian Institute of Health and Welfare, 2017). In Australia, males tend to drink more frequently and at higher levels than females. The proportion of Australians drinking at least one alcoholic drink of any kind (self-reported on a daily basis over the last twelve months) correlates positively with age (across the adolescent and adult age-ranges). However, 18-24 year olds are the age group most likely to consume heavily (i.e. 11 or more standard drinks in a session at least once per month) (Australian Institute of Health and Welfare, 2017).

Among Australian adolescents, alcohol is also the most commonly used intoxicating substance (White & Williams, 2016). Recent data from Australian school students indicate that in 2014, 45.1% of 12-17 year olds had consumed alcohol in the preceding year. Other research highlights that between early adolescence and early adulthood, alcohol use becomes more common; 19% of 12 year olds consumed alcohol in the past year compared with 76% of 17 year olds (White & Williams, 2016). Overall, 8% of school students surveyed in 2014 were identified as current drinkers (i.e. they indicated they had consumed in the past week). This figure was an improvement over data collected in 2011 and 2008, at which time 11% and 17% of school students, respectively, reported consuming in the preceding week (White & Williams, 2016).

Although the proportion of current adolescent drinkers has decreased in recent years, once adolescents begin to drink, they are more likely to drink in much larger quantities and to intoxication than any other age-group (Lam et al., 2017). Furthermore, alcohol-related

emergency department presentations involving young Australians are increasing (Lensvelt et al., 2015).

1.4 Alcohol and the impact on individual health

"Alcohol is a psychoactive substance with dependence-producing properties that has been widely used in many cultures for centuries. The harmful use of alcohol causes a large disease, social and economic burden in societies" (World Health Organization, 2018a, page xiii).

There are many compelling reasons for people to monitor and limit their alcohol consumption. Alcohol use and misuse is one of the most preventable causes of morbidity and mortality worldwide, accounting for 5.9% of all deaths and 5.1% of the global burden of injury and disease (World Health Organization, 2018a), and this burden is increasing (Lim et al., 2012). Furthermore, harmful consumption has been causally linked to over 200 health conditions (World Health Organization, 1992). Traditionally, public policy has tended to focus on acute harms such as drink-driving casualties and other injury, but alcohol consumption is now recognised as a main contributor to non-communicable diseases (NCDs), which in total cause 41 million deaths a year (71% of deaths globally) (World Health Organization, 2018c). Evidence demonstrates a relationship between alcohol consumption and a range of cancers (Baan et al., 2007; Boffetta & Hashibe, 2006), gastrointestinal diseases (liver cirrhosis and pancreatitis) and some cardiovascular diseases (Lim et al., 2012; Rehm et al., 2010).

The shift in focus to alcohol as a risk factor for NCDs and away from a primary focus on the acute risks of consumption is consistent with advice from a recent Australian study (Gao, Ogeil, & Lloyd, 2014). Data presented in this study indicated that most of the harms

due to alcohol are from long-term consumption, with 54% of alcohol-related deaths in males and 76% of deaths in females from cancers, cardiovascular disease or digestive diseases.

In addition to the short- and long-term harms to the individual, there are a range of negative social impacts of alcohol consumption on the drinkers' family, children (among parents) and the community. The scope of harms to others range on a spectrum from direct inconveniences (such as damaged property) to severe harms including physical violence and death. Children may be indirectly affected by parents' drinking via role modelling that encourages their consumption in adolescence and adulthood (Yap, Cheong, Zaravinos-Tsakos, Lubman, & Jorm, 2017), through to the extreme direct effects, including neglect and assault. In Australia, child-protection records indicate that over 19,000 child protection cases a year involve carers' problems with drinking (Laslett et al., 2010). Estimates indicate that total alcohol-related harm, social as well as health related, costs the Australian community approximately $36 billion per annum (Foundation for Alcohol Research and Education, 2011).

The size of the problem in Australia and elsewhere, including the increased evidence of the contribution to NCDs, creates an impetus to challenge Australia's cultural norms around alcohol consumption. Reducing population over-consumption of alcohol is an important public health challenge.

1.5 Alcohol and the rising evidence for a link to cancer

As highlighted above, alcohol intake beyond recommended levels has been linked to the prevalence of a range of NCDs. Importantly, there is evidence of a causal association between alcohol consumption and the occurrence of eight cancers. Moreover, the relationship between alcohol and cancer is a dose-response one (see Parry, Patra, and Rehm (2011), for a discussion of the epidemiology). The strength of the association between alcohol and cancer

has been known for 30 years, and there is now a large body of literature confirming this connection. In 1988, the International Agency for Research on Cancer (1988) classified alcoholic beverages as Group 1 carcinogens. The ethanol present in alcoholic beverages, which has been shown to induce altered physical and mental responses, was subsequently listed as a Group 1 carcinogen in 2010 (World Health Organization International Agency for Research on Cancer, 2010). When a person ingests alcohol, whether through wine, beer or spirits, the body converts it into acetaldehyde which inhibits DNA repair, increasing cancer risk (Boffetta & Hashibe, 2006). Furthermore, the World Cancer Research Fund, (2007) has reported that there is now *convincing evidence*[2] that higher levels of alcohol consumption are associated with an increased risk of cancer of the mouth, pharynx, larynx, oesophagus, bowel cancer in men and breast cancer in women. There is also *probable evidence* that alcohol increases the risk of bowel cancer (in women) and liver cancer in both sexes (World Cancer Research Fund and American Institute for Cancer Research, 2007).

Not all evidence indicates harm from consumption, particularly at low levels, with a major recent paper by Wood et al. (2018) analysing individual data on 599,912 current drinkers highlighting that consumption up to 100g a week (or 10 standard drinks) may offer protective effects against myocardial infarction. Overall, however, the paper concluded that the limits for alcohol consumption should be set at less than 100g per week to minimise all-cause mortality risk. This level (equivalent to 10 standard drinks per week) is lower than those recommended in most guidelines, including the guidelines in Australia (which currently recommend no more than an average of 14 standard drinks a week, discussed further in the

[2] The two highest levels of evidence set by the World Cancer Research Fund are 'convincing'- "evidence is strong enough to support a judgement of a convincing causal relationship. A convincing relationship should be robust enough to be highly unlikely to be modified in the foreseeable future as new evidence accumulates" and 'probable' - "evidence is strong enough to support a probable causal relationship including evidence from at least two independent cohort studies or at least 5 case-control studies" (World Cancer Research Fund and American Institute for Cancer Research, 2007, page 60).

next section – 1.6). The Australian guidelines set by the National Health and Medical Research Council (NHMRC) are currently under review, with an update expected in 2019.

As indicated above, a number of studies have confirmed a dose-response relationship between alcohol and cancer risk for both men and women (Corrao, Bagnardi, Zambon, & La Vecchia, 2004; Hamajima et al., 2002; Pelucchi C., 2011). Given long-term, chronic consumption, there is *convincing evidence* of the link between alcohol and increased risk for 5,070 cases of cancer per annum in Australia (or 5.0% of all cancers). This number increases to 5,663 (or 5.6% of all cancers) when cancers, for which there is a *probable* link between alcohol consumption and disease risk, are included (Winstanley et al., 2011). Assessing awareness of the link between alcohol and cancer among Australians and its relationship with level of consumption is a critical preparatory step before the development of strategies designed to decrease cancer incidence through the moderation of alcohol intake.

1.6 Potential strategic frameworks to reduce alcohol consumption

Given the significant increased risk of NCDs including cancer, and of injury and overall harm, alcohol consumption is a serious public health challenge. Bronfenbrenner's Ecological System Theory states that consumption can be influenced at many different levels, and in multiple environments (known as ecological systems) from the individual level to the macro (societal) level (Bronfenbrenner, 1979). As described by Sudhinaraset, Wigglesworth, and Takeuchi (2016), this theory can be readily applied in the context of alcohol use. In line with this theory, individual-level factors that influence alcohol use include: individual difference variables (e.g. personality), race/ethnicity, immigration status and socio-economic factors (refer to Figure 1). These individual-level factors are nested within a microsystem of home, work and school environments as depicted in Figure 1. This microsystem also includes parental monitoring and parental alcohol use and is nested within the community system. The

community includes community norms and attitudes to alcohol use, cultural norms and gender norms. Finally, macro-level factors, including exposure to advertising and marketing, may influence family and peer network attitudes and norms, which influences individual attitudes and behaviours.

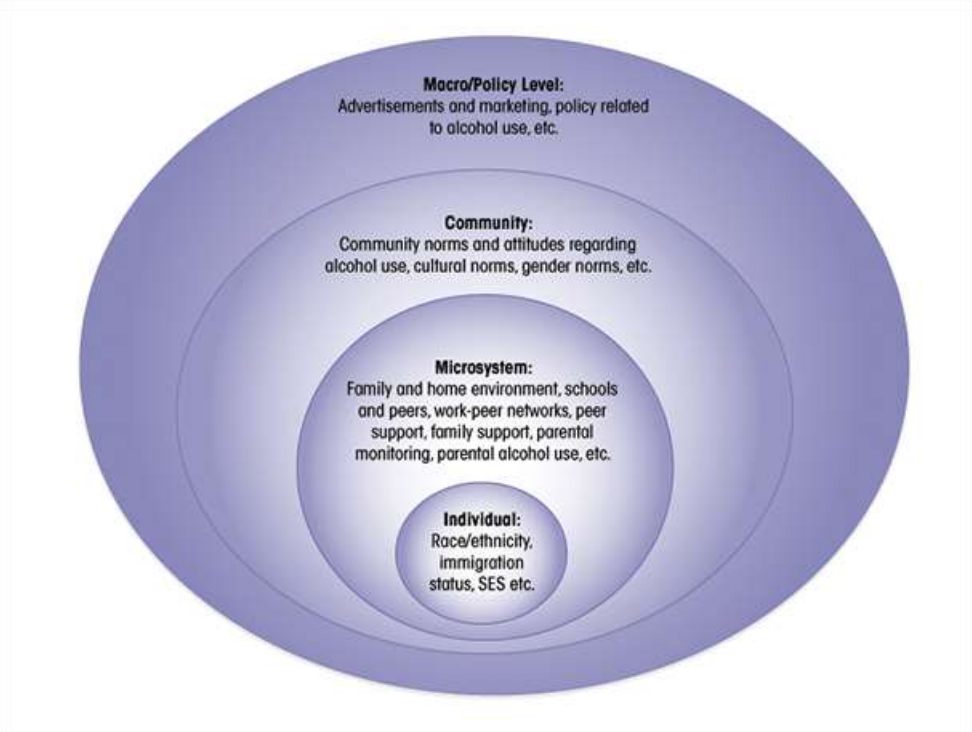


Figure 1. A social-ecological framework for explaining influences on alcohol use (Sudhinaraset et al., 2016, page 36)

Public health programs and strategies have targeted each level. At the individual level, government-funded advertising campaigns have focussed on the 'unattractive' nature of drunkenness, particularly among young people, and how consumption can lead to risky behavioural choices. They have also focussed heavily in Australia on the association of the harms of short-term drinking with motor vehicle accidents (see section 1.9 for further discussion). Additionally some medium-term risks have also been emphasised; for instance, the Australian Government launched a project encouraging health bodies to warn pregnant

women of the dangers and risks of alcohol consumption during pregnancy via the 'Woman Want to Know' Project (Australian Government Department of Health, 2018).

At the community level, strategies to reduce consumption focus on creating a norm for acceptable drinking levels that is in line with Australian Guidelines. At the macro level, strategies may include taxation (or minimum unit pricing) and limiting advertising. The system theory suggests that effective public health requires a multi-level focus that creates an environment that supports moderation in consumption. The current dissertation describes two possible approaches to changing the ecological system that currently supports unhealthy levels of consumption.

1. At the individual level – Given the increasing focus on long-term harms, awareness of messaging around the NHMRC guidelines (which have changed), but are thought to be largely unknown, is required. Furthermore, awareness of the impact on chronic disease incidence, especially cancer, warrants closer examination. This messaging may be effective because cancer is Australia's most feared disease (see section 1.9 for further elaboration).
2. At the microsystem/community level – Changing the norms associated with consumption are critical to the reinforcement schedules that maintain current poor behavioural choices. One possible strategy is to highlight the impact of parental modelling of consumption around children. This approach leverages potential community concern around responsible parenting (see section 1.12-1.14).

Before either of the above can be tested in experimental studies or in real-world settings, potential efficacy can be assessed using cross-sectional study designs.

1.7 Helping people moderate their intake: The role of guidelines

Guidelines that define the limits of behaviour in order to decrease their impact on health risk, are normally the first step in the development of a public health campaign message designed to decrease risk of a specific disease or condition. Guidelines are designed to improve health literacy within the targeted domain (Nutbeam, 2000), and thereby provide a basis upon which informed decision-making can serve to moderate risk.

The process by which guidelines are developed, promulgated and even enforced varies between countries and across time (usually including lower thresholds over time) and may even vary between the institutions providing guidelines. Although guidelines can be described as an example of evidence-based policy, the continually changing nature of evidence is such that guidelines may be "out-of-date" before they are ever effectively promulgated.

Guidelines for low-risk alcohol consumption are now in place in 37 countries world-wide, including in Australia, but recommendations differ across countries (Kalinowski & Humphreys, 2016). Australia utilises the standard drink system to assist in the operationalisation of recommended alcohol consumption limits. Within this system, one *standard drink* contains 10 grams of alcohol, regardless of the type of drink or the size of the container. Counting standard drinks is thought to be a more exact measure of the amount of alcohol consumed compared to counting bottles, glasses or cans. In Australia legislation requires that the number of standard drinks in an alcoholic beverage is shown on the label of the container (Australian Government Department of Health and Ageing, 2009).

The fact that guidelines vary across time and place magnifies the public health challenge. Guidelines evolve with research evidence; they have been promulgated in Australia since 1987 with the latest release dated 2009 (Roche, Pidd, & Taylor, 2011). Once one set of guidelines are developed and disseminated to the public, changing them to keep them in-line

with new evidence can cause confusion. The public may discount new guidelines if they are not accompanied with appropriate messaging, or the campaign or audience reach may not be sufficient to change existing beliefs and recollections of previous guidelines. This causes significant challenges to public health communication. The first guidelines, released in Australia in 1987, defined levels as: 'safe'; 'hazardous' (i.e. two to four standard drinks per day for women or four to six for men); and 'harmful' (i.e. greater than four standard drinks per day for women and six for men). These guidelines were then revised in 1992, with the new update recommending that men not exceed 4 standard drinks of alcohol per day and that women limit their consumption to 2 units per day. The guidelines also included a recommendation to avoid binge drinking (i.e. avoiding the consumption of an excessive amount of alcohol in a short period of time). Furthermore, they included detailed guidelines for specific situations such as pregnancy, or when operating machinery (Plos & Hawks, 1992).

The guidelines were then revised in 2001 in recognition of the growing body of evidence that patterns of consumption were as important as daily intake (Roche et al., 2011). The 2001 guidelines, namely '*Australian Alcohol Guidelines, Health Risks and Benefits*', included the concept of short- and long-term risk and were based on evidence that 1) excess alcohol consumption can cause increased morbidity and mortality, but also 2) evidence that, at low levels, some forms of alcohol may have positive benefits including a reduction in heart disease (National Health and Medical Research Council, 2001). The 2001 guidelines recommended:

- For men; to minimise risks in the short and longer term, and gain any longer-term benefits, an *average* of no more than 4 standard drinks a day, and no more than 28 standard drinks over a week; not more than 6 standard drinks *in any one day*; and one or two alcohol-free days per week.

- For women; to minimise risks in the short and longer term, and gain any longer-term benefits, an *average* of no more than 2 standard drinks a day, and no more than 14 standard drinks over a week; not more than 4 standard drinks *in any one day*; and one or two alcohol-free days per week.
- Adolescents were advised not to drink above levels specified for adults and, if they choose not to drink, to be supported in their decision (National Health and Medical Research Council, 2001).

The 2001 guidelines were promoted through public education campaigns promoting the messages of: "four for men and women two" as reported in Thompson, Palmer, and Raven (2006).

An update of these guidelines was released in 2009 based on new evidence provided from a systematic search and analysis of epidemiological studies published from 2001-2007. These guidelines, for the first time, were based on a specification of lifetime risk of alcohol-related harm, including chronic disease. The threshold was set at the risk being below 1 in 100 if no more than two standard drinks are consumed on average each day (National Health and Medical Research Council, 2009b). These (current) guidelines state that '*for healthy men and women, drinking no more than two standard drinks on any day* ***reduces the lifetime risk of harm from alcohol-related disease or injury****'* and '*for healthy men and women, drinking no more than four standard drinks on a single occasion* ***reduces the risk of alcohol-related injury arising from that occasion****'*. The guidelines for adolescents state that "Parents and carers should be advised that children under 15 years of age are at the greatest risk of harm from drinking and that for this age group, not drinking alcohol is especially important' and 'For young people aged 15−17 years, the safest option is to delay the initiation of drinking for as long as possible" (National Health and Medical Research Council, 2009a, pages 2-4).

It should be noted that these guidelines were based on total risk associated with alcohol consumption, and the risk curve differs for each disease, including cancer. Recent studies have found no safe level of consumption for alcohol and cancer (Nelson et al., 2013) and for this reason Cancer Council Australia recommends that "...to reduce their risk of cancer, people limit their consumption of alcohol. For individuals who choose to drink alcohol, consumption should occur within in the Australian NHMRC guidelines" (Cancer Council Australia, 2015, page 8).

The ambiguity created by changes to guidelines over time, and the complexity within them, is likely to mitigate their effectiveness as a public health educational tool. Knowledge of guidelines about alcohol consumption has been described as poor or limited in some countries, including New Zealand (Sellman & Ariell, 1996), Sweden (Bendtsen, Karlsson, Dalal, & Nilsen, 2011), England (de Visser & Birch, 2012) and also in Australia (Bowring et al., 2012; Livingston, 2012). By contrast, in Denmark, where low levels of knowledge were reported in the 1990s, a long-running public health campaign was associated with increased levels of community knowledge of alcohol consumption guidelines (Gronbaek et al., 2001).

The impact of guidelines is inevitably directly dependent on the adequacy of their dissemination. The 2001 Australian alcohol guidelines were accompanied by a paid national media campaign, 'Alcohol and your Health'. By contrast, the 2009 guidelines relied on limited print media to inform the public of the updated recommendations (Wolfaardt, Brownbill, Mahmood, & Bowden, 2018). More recently, an online survey of Australians found that although 70% were aware of the existence of the "Australian Guidelines to Reduce Health Risks from Drinking Alcohol", only 40% could correctly identify the recommended number of drinks to reduce long-term harm and only 7% correctly identified the number of drinks to minimise short-term-harm (Foundation for Alcohol Research and Education, 2018). The extent to which people are aware of the specific Australian alcohol guidelines that apply

to management of cancer risk is currently unknown, however their recent promulgation and the fact that they have not been accompanied with any educational campaigns suggests that knowledge is likely to be poor. This thesis focussed on awareness of the more widely promoted guidelines by the NHMRC (or Australian Government) as outlined previously, because the Cancer Council Australia Guidelines were not set at the time of the development of this thesis and they refer to the NHMRC guidelines for those who choose to drink.

1.8 Predictors of behaviour, and the role of knowledge and education in theoretical frameworks – tackling change at the individual level

One key area of focus for alcohol interventions designed to reduce consumption is to address the extent to which individuals perceive consumption as increasing risk for negative outcomes, in either the near- or long-term. In the context of the latter, their knowledge of the health effects of alcohol consumption, particularly the impact on cancer risk, may provide a useful framework for messaging. Indeed, it has been argued that increased awareness of the link between smoking and cancer has been a key factor in the reduction of smoking rates (US Department of Health and Human Services, 1982), and a review by Vernon (1999) found that perceived risk of cancer was associated with mammography screening among women. The advantage of a message that focuses on the link between alcohol and cancer is twofold. First, cancer has been associated with a strong fear response (Borland, Donaghue, & Hill, 1994), thereby heightening its motivating impact. Second, the dose-response relationship between alcohol consumption and cancer risk allows for a movement away from monitoring and towards limiting intake.

In social psychology, social cognitive and stages of change models emphasize that public perceptions of risk factors are important in stimulating behaviour change and improving uptake of health-promoting behaviours. A recent meta-analysis has confimed a

significant, but modest, relationship between risk perceptions and health behaviour (Sheeran, Harris, & Epton, 2014). The Transtheoretical Model of Prochaska and DiClemente (1982) postulates that increasing consciousness of risk is a key precursor to health behaviour change. Within this model, awareness of behavioural risk factors helps move people from "pre-contemplation" (i.e. not currently aware of the need to consider behaviour change) to "contemplation" (i.e. considering changing behaviour) and penultimately, to "preparation/determination" (i.e. intention to take action) and finally to "action" (Prochaska, 1994; Prochaska & DiClemente, 1982). Importantly, achieving awareness is a critical component of rational human decision-making; having adequate information is important to the process of weighing up the risks and benefits of behaviour, as well as a fundamental consumer right. Estimates indicate that the alcohol industry spends approximately AUD $220 million on alcohol advertising per year in Australia (White et al., 2015), serving to reinforce alcohol-related norms and creating an imbalance of information favouring the benefits of drinking. "As a result of the industry's considerable investment in alcohol marketing, drinking decisions are made in the context of a vast information asymmetry that emphasises the benefits of alcohol consumption and minimises information about potential harms." (Dunstone et al., 2017, page 312). It is the legitimate role of public health and health promotion to try to help redress this imbalance.

1.9 Community perceptions of the link between alcohol and cancer – how much do people know?

International evidence suggests that there is poor knowledge of the link between alcohol and cancer at the population level, thereby highlighting a potential avenue for intervention. For example, a population survey conducted in the UK with people aged 16 years and over indicated that only 14% of respondents named, unprompted, 'drinking

excessive alcohol' as a risk factor for cancer (Sanderson, Waller, Jarvis, Humphries, & Wardle, 2009). Similarly, when the question "what can people do to reduce their cancer risk?" was asked, only 11% of Americans aged over 18 nominated reducing alcohol consumption (Hawkins, Berkowitz, & Peipins, 2010). Similarly, a British survey of 15 year olds, showed that 28% thought that cancer risk could be addressed by consuming alcohol in moderation (Redeker, Wardle, Wilder, Hiom, & Miles, 2009). More recently, an international review of 32 studies examining awareness of alcohol as a risk factor for cancer has highlighted that globally, awareness tends to be low and varies across countries. This paper concluded that there have been limited attempts to increase awareness and this constitutes a significant public health challenge (Scheideler & Klein, 2018).

There have been few studies conducted in Australia, although two older studies conducted prior to this thesis, highlighted poor knowledge. In a population survey of 1095 adults, Baghurst, Baghurst, and Record (1992) reported that 35% of South Australians saw alcohol, when prompted, as very important in relation to increased cancer risk. Unprompted results were less encouraging: Hall, Flaherty, and Homel (1992) interviewed 500 adults in New South Wales and found that no respondents identified the link between alcohol and cancer when asked to list the health problems associated with alcohol use.

Improving community understanding of the modifiable risk factors associated with cancer has been identified as a key cancer prevention strategy (World Health Organization, 2010). Achieving this goal may also be facilitated by the fact that cancer is a feared disease in many cultures (Blendon & Georges, 2011; Borland et al., 1994). The corollary of these observations is that education that highlights the link between alcohol and cancer may, for some sub-groups, provide some impetus for moderation of intake.

1.10 Education campaigns have traditionally focussed on short-term harms

Although education campaigns may motivate changes in thinking about long-term drinking behaviour from the pre-contemplation stage to the contemplation stage, most campaign activity to date across the world has focussed on the short-term harms of alcohol. This is despite the evidence that much of the harm is due to NCDs and long-term consumption (Gao et al., 2014). A content analysis of 110 different alcohol harm-reduction ads world-wide found that 52% of ads focussed on short-term harms, with only 10% addressing long-term harms, 18% addressing underage drinking, 17% communicating "how to change" messages and 3% advocating for policy change. The authors argued that, given that most of the harms due to drinking are long-term, future campaigns would fill an important gap if they were to focus on these harms (Dunstone et al., 2017). In support of this, a recent mass media campaign aired in Western Australia to highlight the link between alcohol and cancer indicated that such a campaign could raise awareness among women of the link between alcohol and breast cancer, and knowledge of drinking guidelines. Unfortunately it did not reduce drinking behaviour, which the authors argued may be attributed to competing product marketing and pro-drinking social norms (Dixon et al., 2015).

A more recent experimental study measured the impact of varying styles of advertisements on motivations to reduce drinking and found that an advertisement about the link between alcohol and cancer was the most motivating, and advertisements that demonstrated 'why change' rather than 'how to change' were more motivating (Wakefield et al., 2017). Furthermore, an experimental study by Wakefield et al. (2018) demonstrated that adding low-risk drinking guidelines to advertisements can increase intentions to reduce consumption among both low and high-risk drinkers (i.e. including those who need it the most).

1.11 Education as a national and international public health strategy

Although the vast majority of alcohol-related education campaigns across the world have focussed on short-term harms, there is now increased global recognition of the significant contribution of alcohol to NCDs. In support of this, the World Health Organization released a *'Global strategy to reduce the harmful use of alcohol'* in 2010 (World Health Organization, 2010). One objective within this strategy highlights awareness raising as a key strategy, pointing to the need for "…raised global awareness of the magnitude and nature of the health, social and economic problems caused by harmful use of alcohol, and increased commitment by governments to act to address the harmful use of alcohol" (World Health Organization, 2010, page 8). Within this strategy, a recommended policy option and intervention is: "…ensuring broad access to information and effective education and public awareness programmes among all levels of society about the full range of alcohol-related harm experienced in the country and the need for, and existence of, effective preventive measures" (World Health Organization, 2010, page 11).

Furthermore, the World Health Organization has also, in recent years, recognised the lack of progress globally in the fight against non-communicable diseases (NCDs), the leading cause of death worldwide. They have now stated within their NCD strategy that "Governments should increase the empowerment of individuals to take action by actively promoting health literacy, including in formal education curricula, and targeted information and communication campaigns. This could include convening marketing experts and behavioural economists to develop public health campaigns designed to educate different populations on how best to prevent and mitigate the risk factors and harms of NCDs." (World Health Organization, 2018d, page 40). Therefore, increased education has been nominated as an important global public health priority.

In addition to increased education being a global priority, it is also a named priority within Australia – although there has been little progress in alcohol policy over the past 40 years, other than measures to counter drink-driving (Foundation for Alcohol Research and Education, 2017). For the first time in 10 years, the Australian Government is currently developing a National Alcohol Strategy. In addition to highlighting the importance of availability, pricing and minimising promotion, which are all important aspects of a multifaceted approach, the draft strategy (under consultation at the time of writing) has an objective to improve knowledge through public health campaigns promoting awareness of risks and harms (Commonwealth of Australia, 2018).

1.12 The development of alcohol consumption behaviour: the role of a "critical period"

In addition to educating adults about the long-term health consequences of alcohol consumption, education campaigns could highlight the influence of adults' consumption on others, particularly children. This strategy has been employed in other public health fields, including tobacco control, where a focus on passive smoking and smoking during pregnancy has been used to highlight social responsibility. A strategy focussing on parents may have two benefits. First, it may motivate personal responsibility and reductions, especially given that 50% of Australians aged 18-59 years are parents of dependent children (see Paper four in this thesis). Second, it may motivate people to consider the indirect impact of their intake on their children's current and future drinking behaviour by highlighting their importance as a role model (outlined in sections 1.12 and 1.13).

Research suggests that expectancies about alcohol consumption (and drug use) are formed in early childhood (Biederman, Faraone, Monuteaux, & Feighner, 2000; Miller, Smith, & Goldman, 1990; Voogt et al., 2017). Drinking patterns are predominantly developed

in adolescence, and consumption, particularly early age of initiation, is a predictor of poorer health in later life (Yap et al., 2017). Early initiation also leads to risky alcohol use, which is the leading cause of death and disability in 15-24 year olds globally (Mokdad et al., 2016). Moreover, young people who commence drinking before the age of 15 are four times more likely to meet criteria for alcohol dependence in their lifetime (Grant & Dawson, 1997). Adolescence is a key time for brain development; key pathways for learning, judgement and impulse control are all still in development at this time (Petit, Kornreich, Verbanck, Cimochowska, & Campanella, 2013). The developing brain, especially the hippocampus, is particularly susceptible to the impact of alcohol and this impact can compromise mental health and neuro-cognitive functioning in adulthood (Hermens et al., 2013; Office of the Surgeon General, 2007). For these reasons, prevention efforts are opportune during this period and, consistent with this, the Australian NHMRC guidelines recommend that abstinence is the safest option for people under the age of 18 years (National Health and Medical Research Council, 2009a).

1.13 What role do parents have to play in delaying or reducing adolescent consumption?

In addition to targeting parents to reduce their consumption for their own health, parents also have an important role to play in the development of their child's relationship with alcohol, and therefore an influence on future drinking rates across Australia. Yap et al. (2017) argue in their recent systematic review that the Australian alcohol guidelines (and similar guidelines in the UK) are directed toward parents as gatekeepers for the implementation of recommendations for the health of their children. Consistent with this, a systematic review of reviews on the effectiveness of prevention interventions by Stockings et al. (2016) indicated that after interventions based on taxation (i.e. environmental influence),

psychologically based interventions targeting parents of young people (e.g. providing information about rule setting, monitoring and supervision and parent-child communication) were the only interventions that had meaningful benefit (albeit a small effect size).

The 'Parenting Guidelines for Adolescent Alcohol Use' were released to the Australian community in 2011 to complement the alcohol guidelines set by the NHMRC for alcohol consumption, recognising the important role parents play in alcohol uptake and establishing patterns of use. These Parenting Guidelines were developed based on a systematic review (Ryan, Jorm, & Lubman., 2010) and the opinions of a panel of experts (Ryan et al., 2011). The guidelines encourage parents to: be a good role model; talk about alcohol; establish family rules; monitor their child; prepare for peer influence by encouraging positive friendships; and prepare their child for situations where others misuse alcohol. Specifically, they encourage parents to *limit* their alcohol use, particularly around children, and recommend that *parents should not get drunk*, especially in front of their children. (Ryan et al., 2011).

1.14 The role of implicit and explicit parental behaviours

Evidence has consistently found that parental role modelling is an important implicit protective factor for alcohol initiation (Getz & Bray, 2005; Hawkins et al., 1997; Peterson, Hawkins, Abbott, & Catalano, 1994; Ryan et al., 2010) and levels of later alcohol use in adolescents, albeit with a small effect size (Yap et al., 2017). The effect of role modelling on adolescent consumption, as argued by Raitasalo, Holmila, and Mäkelä (2011), is consistent with Bandura's Social Learning Theory, where individuals learn behaviour through observing and interacting with those they are closest to (Bandura, 1977). The evidence is not yet clear as to whether there is a safe level of consumption to model. One Australian study concluded that 'parental drinking (*especially if it is frequent and heavy*) does increase the likelihood of early

adolescent drinking' (Homel & Warren, 2017, page 82), implying that there is some potential for a "safe" level of consumption among parents.

In addition to the indirect effects of role modelling on adolescents' consumption, children can be directly affected by a parent's or caregiver's drinking in their presence. Excessive alcohol use can lead to poor supervision of children, potentially resulting in injury (Crandall, Chiu, & Sheehan, 2006) and sometimes, ongoing neglect or maltreatment (Laslett, Room, Dietze, & Ferris, 2012). Although there is some population research to suggest that parents are less likely to consume alcohol at risky levels than non-parents, more than 700,000 Australian children live in households where consumption is substantial (Maloney, Hutchinson, Burns, & Mattick, 2010). These studies did not investigate parental consumption by age of the children in the home, which has implications for direct and indirect influence on children. Furthermore, evidence is sparse, with only a few studies worldwide assessing actual consumption in front of children (Hutchison, 1999; Raitasalo et al., 2011) or social attitudes and norms about alcohol consumption in front of children (Fjær, Pedersen, von Soest, & Gray, 2016; Scheffels, Moan, & Storvoll, 2016).

Evidence shows that descriptive norms (i.e. what people think other people do) influence adolescent and young adult consumption (Haug, Ulbricht, Hanke, Meyer, & John, 2011; Kypri & Langley, 2003; Neighbors, Lee, Lewis, Fossos, & Larimer, 2007). Injunctive norms (i.e. what people think others think they should do, as described by Cialdini, Kallgren, and Reno (1991)) may also influence parental drinking behaviour. Further work is required to document the nature of the associations between these norms and consumption among parents in Australia.

One study by Raitasalo et al. (2011) in Finland identified a widely shared injunctive norm that might usefully impact behaviour. In this study, 72% of the sample believed drinking in the presence of *small* children was unacceptable. Furthermore, acceptability of

parents being drunk in the presence of small children was low, with 95% saying it was unacceptable. The study also found that women were generally stricter in their views than men, but that there were no differences in opinion by age of youngest child in the home. Another study in Norway by Scheffels et al. (2016) found that drinking a glass of wine in front of a 10 year old child was acceptable, but getting intoxicated (either slightly or clearly) was viewed as problematic. This study also investigated perceptions of drinking and drunkenness by gender of the parent and found no difference.

In addition to the implicit role-modelling of parents, parental rules and disapproval of consumption (or explicit behaviour by parents) may also influence adolescent drinking behaviour, but evidence on this effect is mixed. A review of longitudinal studies by Ryan et al. (2010) found that three studies demonstrated an association between parental disapproval and delay of initiation. Two of these were conducted in the US (Andrews, Hops, Ary, Tildesley, & Harris, 1993; Sieving, Maruyama, Williams, & Perry, 2000) and one in Holland (Spijkerman, Van den Eijnden, Overbeek, and Engels (2007). However, two other studies from the US found no association (Peterson et al., 1994; Reifman, Barnes, Dintcheff, Farrell, & Uhteg, 1998), and another from the US had inconsistent findings (Power, Stewart, Hughes, & Arbona, 2005). These mixed findings are worthy of further investigation in Australia.

A broader perspective, the Social Development Model by Catalano (1996), emphasises that attitudes and anti-social behaviours such as alcohol consumption among teenagers are acquired through interaction with different groups of "others". In line with this model, alcohol consumption among young people has been associated with parental concerns about drinking (Kloep, Hendry, Ingebrigtsen, Glendinning, & Espnes, 2001), peer use, and perceptions of peer attitudes to alcohol use (Cleveland & Wiebe, 2003). This model proposes that the influence of peers will become increasingly important in later adolescence, a time at which parental involvement and the influence of family declines (Catalano, 1996).

1.15 Research justification

More research is required to address gaps in our knowledge about individual and system variables that impact consumption. Understanding of this is critical in order to develop effective public health messaging. It is possible that messages that focus on long-term harms, particularly cancer risk, or the impact of consumption on highly valued others (i.e. children), might impact on preparedness to think about decreasing consumption. This awareness of the long-term risks is seen as a precursor to population behaviour change.

1.16 Research aims

In line with Bronfenbrenner's Ecological System, the primary aims of this thesis are to investigate factors that may influence consumption at the individual level including: 1) the extent to which Australian consumption patterns comply with the Australian guideline to reduce lifetime risk of disease; 2) how compliance relates to awareness of the guideline; and 3) perceptions of the importance of alcohol as a risk factor for cancer and how this relates to compliance (Paper one). Furthermore, there is a dearth of evidence on awareness of the link between alcohol consumption and cancer among young people and school students. Study two aims to: 1) confirm documented prevalence of alcohol consumption among school students; 2) examine perceptions of the importance of alcohol as a risk factor for cancer; and 3) examine the influence of perceived parental disapproval and peer approval on consumption (Paper two).

In line with Bronfenbrenner's Ecological System, one strategy for reducing long-term parental consumption may be to tackle the community/microsystem by highlighting the flow-on effects to children of parents' modelling of attitudes to, and rules about, their own consumption. Implicit behaviours taught through role modelling, and explicit behaviours

endorsed by rule setting and disapproval of alcohol consumption, may have an important role to play in the subsequent behaviour of children. Research evidence is currently mixed on the role of parental disapproval. Answering this open question is a major aim of the investigation of the role of parents and peers, which will be described in Paper two. Furthermore, alcohol consumption among Australian parents has received limited research attention. Consequently, Paper three will assess this gap by assessing: 1) alcohol consumption patterns among parents; 2) places where alcohol is consumed by parents; and 3) how these vary by age of the youngest child in the household. Levels of drinking in front of the child, by gender of the parent in Australia and descriptive and injunctive norms about drinking in front of children (from moderate drinking to drunkenness) are investigated in Paper four.

CHAPTER 2: PAPER ONE

2.1 Preamble

The first paper focusses on awareness of the long-term harms of alcohol consumption and the link between awareness and behaviour in order to provide initial evidence as to the likely impact on consumption of campaigns that highlight long-term harms. Analyses of pre-existing data and additional questions were included to address the following questions:

i) What is the prevalence of adults drinking in excess of the health guidelines for increased lifetime risk?

ii) What is the prevalence of awareness of these guidelines?

iii) Which demographic factors correlate with drinking in excess of these guidelines?

iv) What is the prevalence of awareness about the link between alcohol consumption and risk for cancer? and,

v) Is this awareness associated with a lower likelihood of exceeding the guideline for increased lifetime risk?

It was hypothesised that awareness of the link between alcohol and cancer would be low based on Australian studies conducted 20 years prior, and studies in the US and the UK in 2009 and 2010. Based on the findings from similar studies in New Zealand, UK, Sweden, and previously in Australia, it was also hypothesised that many people would not understand the current health guidelines for increased lifetime risk. A population survey was chosen to allow results to be generalisable to the community and some data dating back to 2004 were also used to examine cohort differences.

Alcohol consumption and NHMRC guidelines: has the message got out, are people conforming and are they aware that alcohol causes cancer?

Published paper[3]

2.2 Statement of authorship

Principal author

Name of Principal Author (Candidate)	Jacqueline Bowden		
Contribution to the Paper	I was responsible for primary authorship of this paper, and led its conceptualisation and design in collaboration with co-authors. I conducted the statistical analyses, and took the lead role in interpreting the results and writing and revising the manuscript. I served as corresponding author and was responsible for manuscript submission, revisions, and responses to journal reviews.		
Overall percentage (%)	80		
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
Signature		Date	24 August 2018

Co-author contributions

By signing the Statement of Authorship, each author certifies that:

i. the candidate's stated contribution to the publication is accurate (as detailed above);
ii. permission is granted for the candidate in include the publication in the thesis; and
iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Professor Carlene Wilson
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I also provided advice on responding to comments by the journal reviewers and editor.

[3] Bowden J, Delfabbro P, Room R, Miller C, Wilson C. (2014). Alcohol consumption and NHMRC guidelines: has the message got out, are people conforming and are they aware that alcohol causes cancer? *Australian New Zealand Journal of Public Health*, 38(1), 66-72.

Signature		Date	25 August 2018

Name of Co-Author	Professor Robin Room		
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I also provided advice on responding to comments by the journal reviewers and editor.		
Signature		Date	25 August 2018

Name of Co-Author	Professor Paul Delfabbro		
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I also provided advice on responding to comments by the journal reviewers and editor.		
Signature		Date	25 August 2018

Name of Co-Author	A/Professor Caroline Miller		
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I also provided advice on responding to comments by the journal reviewers and editor.		
Signature		Date	25 August 2018

2.3 Paper one

ABSTRACT

Objective: To examine self-reported alcohol consumption (and drinking in excess of the 2009 NHMRC Guideline of 2 standard drinks per day), and relationships between consumption, awareness of the Guideline threshold and perceptions of alcohol as a risk factor for cancer.

Methods: Questions were included in annual, cross-sectional surveys of approximately 2,700 South Australians aged 18 years and over from 2004 to 2012. 2011 and 2012 consumption data were merged for the majority of analyses.

Results: In 2011 and 2012, 21.6% of adults drank in excess of the Guideline threshold (33.0% males; 10.7% females). While 53.5% correctly identified the NHMRC consumption threshold for women, only 20.3% did so for men (39.0% nominated a higher amount). A large minority said they did not know the consumption threshold for women (39.2%) or men (40.4%). In 2012, only 36.6% saw alcohol as an important risk factor for cancer. Important predictors of excess consumption for men were: higher household income; and, not perceiving alcohol as an important risk factor for cancer. Predictors for women were similar but the role of household income was even more prominent.

Conclusions: Men were nearly three times as likely to drink in excess of the Guideline as women. The majority of the population did not see an important link between alcohol and cancer. Awareness of the latest NHMRC Guideline consumption threshold is still low, particularly for men.

Implications: A strategy to raise awareness of the NHMRC guidelines and the link between alcohol and cancer is warranted.

INTRODUCTION

Alcohol consumption is a common and widespread feature of Australian culture. In 2010, 75.5% of Australians aged 12 years and over reported that they had consumed alcohol over the previous year, with 28.1% reporting that they drank in excess of the National Health and Medical Research Council (NHMRC) guideline for increased risk of alcohol-related harm in their lifetime (Australian Institute of Health and Welfare, 2011). Alcohol causes substantial negative social, health and economic consequences for the Australian population. The total costs caused by alcohol in Australia has been estimated to be $15.3 billion per annum (Collins & Lapsley, 2008). In addition, consumption has been causally linked to over 60 medical conditions in Australia with estimates suggesting that it causes 3,430 deaths per year and generates 85,435 disability adjusted life years lost (Begg et al., 2007)[4].

Alcohol use and cancer

A large body of literature now demonstrates that there is a relationship between the consumption of alcoholic beverages and cancer. In 1988, alcoholic beverages were classified as a Group 1 carcinogen (World Health Organization and International Agency for Research on Cancer, 1988) because of the presence of ethanol in alcohol beverages (World Health Organization International Agency for Research on Cancer, 2010). There is now convincing[5] evidence that higher levels of alcohol consumption are associated with an increased risk of cancer of the mouth, pharynx, larynx, oesophagus, bowel (in men) and breast cancer in women. There is also probable evidence that alcohol may increase the risk of bowel cancer (in women) and liver cancer (World Cancer Research Fund and American Institute for Cancer Research, 2007).

[4] While this was the most up-to-date reference at the time of publication, new data available at the time of drafting this thesis indicated that alcohol causes an estimated 5,500 deaths (Gao et al., 2014).
[5] Convincing and probable are the two highest levels of evidence set by the World Cancer Research Fund, these levels identify a causal relationship between alcohol and cancer.

A number of studies suggest that there is a dose-response relationship between alcohol and cancer risk for men and women (Corrao et al., 2004; Hamajima et al., 2002; Nelson et al., 2013; Pelucchi C., 2011) and that there is convincing evidence that 5,070 cases of cancer per annum in Australia may be attributable to long-term consumption of alcohol. This number increases to 5,663 when one also includes cancers for which there is a probable link between alcohol consumption and risk (Winstanley et al., 2011).

Alcohol guidelines

Alcohol guidelines are used widely internationally as a mechanism to provide evidence-based information recommending upper limits for safe alcohol consumption (Stockwell & Room, 2012). Australia utilizes a standard drink system and within this system, one standard drink contains 10 grams of alcohol. Australia was an early adopter of the use of alcohol consumption guidelines, with the first guidelines introduced by the National Health and Medical Research Council (NHMRC) in 1987. These were revised in 1992, 2001 and 2009 (Room & Rehm, 2012).

In 2001, the NHMRC guidelines recommended that men should drink no more than 4 standard drinks per day on average, and women, no more than 2. In addition, one or two alcohol-free days per week were recommended (National Health and Medical Research Council, 2001).

In 2009, as more evidence on the effects of alcohol became available, the guidelines were revised. The updated guidelines stated that 'for healthy men and women, drinking no more than two standard drinks on any day reduces the lifetime risk of harm from alcohol-related disease or injury' (National Health and Medical Research Council, 2009a). To date, there has not been an Australian Government campaign promoting these guidelines widely (Room & Rehm, 2012).

It is important to note that these guidelines are based on total risk associated with alcohol consumption and the risk differs for each disease, including cancer. A recent study found no safe threshold for alcohol and cancer risk (Nelson et al., 2013); therefore Cancer Council Australia (CCA) recommends that "to reduce their risk of cancer, people limit their consumption of alcohol, or better still avoid alcohol altogether[6]. For individuals who choose to drink alcohol, CCA supports drinking only within the National Health and Medical Research Council (NHMRC) guidelines to reduce health risks from drinking alcohol" (Winstanley et al., 2011, page 481).

Generally, studies conducted internationally in developed countries (e.g. New Zealand (Sellman & Ariell, 1996), Sweden (Bendtsen et al., 2011), and England (de Visser & Birch, 2012)) and recently in Australia (Bowring et al., 2012; Livingston, 2012), have shown limited community awareness of drinking guidelines themselves or of their thresholds. However, in Denmark a concerted and long-running campaign increased community knowledge of alcohol consumption guidelines (where 9 years post-implementation, more than 50% of respondents were aware of the guidelines for their gender in 1999) (Gronbaek et al., 2001).

Community perceptions of the link between alcohol and cancer

Improving community understanding of the modifiable risk factors associated with cancer has been identified as a key cancer prevention strategy globally (World Health Organization, 2004). Achieving this goal may be facilitated by the fact that cancer is one of the most feared diseases in Australia (Borland et al., 1994) and internationally (Blendon & Georges, 2011). Therefore, education programs highlighting the link between alcohol and cancer may, for some sub-groups, provide some impetus for moderation of intake.

[6] At the time of publication, this was the current position statement on alcohol by Cancer Council Australia. The current position statement (referred to in Chapter 1) no longer includes 'or better still avoid alcohol altogether'.

International evidence shows that the majority of people are not aware of the link between alcohol and cancer (Hawkins et al., 2010; Redeker et al., 2009; Sanderson et al., 2009). More research on this topic is needed in Australia.

Alcohol consumption by demographic factors

It is well documented that a number of modifiable risk factors for cancer are associated with lower socio-economic status and income, including smoking, energy-dense food intake and physical inactivity. However the relationship between socio-economic status and alcohol consumption is less clear. A Canadian study found that there was a positive relationship between socio-economic status and increased alcohol consumption (Pomerleau, Pederson, Ostbye, Speechley, & Speechley, 1997) but a recent Australian study showed that while there was no difference in consumption by socio-economic status among men, among women, those with the second-lowest income quintile were less likely to be at risk of long-term harm than those with higher incomes (Giskes, Turrell, Bentley, & Kavanagh, 2011).

A general focus of the literature on variations in alcohol consumption in the population has been on the prevalence and correlates of abstinence and of excessive consumption, particularly binge drinking or acute drinking behaviour. Fewer studies have examined the factors that influence patterns of regular drinking associated with an increased risk of chronic disease (Giskes et al., 2011). Accordingly, to address this gap in the literature, the aim of this paper was to examine the extent to which Australian consumption patterns: (a) comply with the most recent NHMRC guidelines, (b) how compliance relates to awareness of the guidelines; and, (c), perceptions of the importance of alcohol as a risk factor for cancer and how this relates to compliance.

MATERIALS AND METHODS

Questions to assess perceptions of the link between alcohol and cancer (outlined below) were included in the South Australian Health Omnibus Survey every second year from 2004 to 2012 (Government of South Australia Population Research and Outcomes Unit, 2004). The majority of analyses were undertaken using combined data from 2011 and 2012 because the proportion of females drinking in excess of the guidelines was too small to allow meaningful analysis. Data sets were appropriate to combine because although the dependent variable differed significantly between 2011 (19.8%) and 2012 (23.4%) ($df= 1, N = 5769$) $=6.29$, $p < .05$) the effect size was small, with the phi-coefficient (φ) of 0.046. The Health Omnibus user-pays, face-to-face survey employs a multi-staged, systematic clustered area sampling of households in the Adelaide metropolitan area and regional centres. Ethics approval was obtained from Cancer Council South Australia Human Research Ethics Committee and the SA Department of Health Research Ethics Committee.

Each survey draws independent samples of 4,400 households with an observed participation rate in the order of 70%, yielding approximately 3,000 completed interviews per annum. Data are weighted to the South Australian population by age, sex and geographic area. Interviews were conducted with individuals aged 15 years and over. The current analyses report data for adults aged 18 years and over. Sample sizes ranged from 2693 (2008) to 2912 (2012), with a participation rate between 61% (2010) and 74% (2004).

Measures

Average daily alcohol consumption was measured by a series of 10 questions using a quantitative graduated frequency method taken from the National Drug Strategy Household Survey 2010. Questions E7, E15 and E17 of the survey provide further information

(Australian Institute of Health and Welfare, 2010b). These data were then coded according to whether the respondent was below the threshold for lifetime risk status of alcohol consumption according to the 2009 NHMRC guidelines (Guideline 1) (Welfare, 2010), above that but less than double the level, or above double the level (i.e. 4.01 drinks per day or more).

Using the approach adapted from a previous study (Baghurst et al., 1992), participants were asked to rate the importance of 3 factors (smoking cigarettes, pollution and alcohol) in increasing a person's risk of getting cancer on a five point scale (1= not at all important, 2=slightly important, 3=moderately important, 4=very important and 5=extremely important), with available responses presented to them on a prompt card. Participants were also asked 'How many standard alcoholic drinks do health agencies recommend as the limit per day for women?'. The same question was then asked to determine the perceived limit for men. The free response data were then coded into response categories reflecting the previous NHMRC guidelines for lifetime risk (2001) and the current NHMRC guideline to reduce lifetime risk (2009). These questions were asked in the context of a general health survey, which included demographic questions, and the questions were piloted with approximately 50 participants. Postcode data were merged with the Socio-economic Index for Areas 2001 - Index of Disadvantage to allow analysis by ecological measures of level of disadvantage (Australian Bureau of Statistics, 2008).

Statistical analyses

Statistical analyses were undertaken using StataSE 11, the estimating tools of which account for the clustered, stratified survey design. Data collected in 2011 and 2012 were used to assess current daily consumption and awareness of the current NHMRC guidelines. Data from 2004-2012 were used to assess perceptions of the link between various risk factors and cancer.

To determine predictors of drinking in excess of the NHMRC guidelines using the combined 2011 and 2012 data, the analyses were undertaken in two phases. The first phase involved univariate, chi square analysis for each gender separately of the demographic and other factors associated with consumption in excess of the NHMRC guidelines. The first stage of the analysis involved identifying which variables were associated with drinking above or below the recommended guidelines at a univariate level. Those variables which were identified as being significant (at $p<0.05$ level) were then entered into logistic regression models. Modelling was conducted via backwards elimination.

RESULTS

Alcohol consumption – how many people drink in excess of NHMRC guidelines?

In 2011 and 2012, 9.0% of South Australians aged 18 years and over drank alcohol on a daily basis, 42.1% on a weekly basis and 31.1% less than weekly. A further 9.1% were classified as ex-drinkers (i.e. they had not consumed in the past 12 months) and 8.7% had never consumed a full glass.

Table 1 shows that in 2011 and 2012, 21.6% of the community drank more than two drinks on average per day, i.e. in excess of the NHMRC guidelines (33.0% of males and 10.7% of females). Males were significantly more likely to drink in excess of the guidelines ($\chi 2$ (df= 1, N = 5770) =355.68, $p < .001$).

Table 1. *Average daily alcohol consumption by gender for adults aged 18 years and over, 2011 & 2012*

	Males n (%)	Females n (%)	Total n (%)
Abstinent	344 (12.2)	683 (23.2)	1027 (17.8)
Less than 2 drinks per day but not 0	1551 (54.8)	1943 (66.1)	3494 (60.6)
2.01 – 4.00 drinks per day	552 (19.5)	251 (8.5)	803 (13.9)
4.01 drinks per day and over	380 (13.5)	65 (2.2)	445 (7.7)

weighted counts, n=5769

Community awareness of the 2009 NHMRC guidelines

Table 2 shows that in 2011 and 2012, 53.5% of South Australians aged 18 years and over correctly identified the NHMRC guidelines threshold consumption levels for women, but that over a third did not know the answer (39.2%). Females were significantly more likely to correctly identify their guidelines threshold consumption levels than males ($\chi 2$ (df =4 , N = 5770)=8.1, $p < .001$). The table also shows that 20.3% of the population could correctly identify the NHMRC guidelines threshold consumption levels for men, a further 39.0% incorrectly thought that men could drink over 2 drinks per day (consistent with the 2001 guidelines), and the remaining 40.4% did not know the answer. Females were significantly more likely to think that men could drink between 2 and 4 drinks per day than men ($\chi 2$ (df =4 , N = 5770)=3.8, $p < .05$).

Table 2. *Awareness of the number of standard drinks health agencies recommend per day (aged 18 years and over, 2011 & 2012)*

Drinks per day	Males n (%)	Females n (%)	Total n (%)
Guidelines for women			
0 drinks a day	16 (0.6)	6 (0.2)	22 (0.4)
2 or less drinks (but not 0)	1407 (49.8)	1677 (57.0)	3084 (53.5)
2.01-4.00 drinks	206 (7.3)	158 (5.4)	364 (6.3)
Over 4 drinks	17 (0.6)	20 (0.7)	38 (0.7)
Don't know	1181 (41.8)	1081 (36.8)	2262 (39.2)
Guidelines for men			
0 drinks a day	12 (0.4)	6 (0.2)	17 (0.3)
2 or less drinks (but not 0)	609 (21.6)	564 (19.2)	1173 (20.3)
2.01-4.00 drinks	918 (32.5)	1056 (35.9)	1973 (34.2)
Over 4 drinks	156 (5.5)	119 (4.1)	275 (4.8)
Don't know	1132 (40.1)	1198 (40.7)	2331 (40.4)

Weighted count n= 5770

Perceptions of the link between alcohol and cancer

Figure 1 shows the proportion of respondents who perceived smoking, pollution and alcohol as 'very' or 'extremely' important risk factors for cancer across 5 data points (2004, 2006, 2008, 2010 and 2012). As shown, the majority of participants (over 90%) perceived smoking as either 'very' or 'extremely' important and a high proportion of participants (approximately 72%) perceived the pollution to be 'very' or 'extremely important'. Although the proportion of participants perceiving alcohol as a 'very' or 'extremely important' increased significantly from 22.4% in 2004 to 36.6% in 2012 ($\chi 2$ (df = 1 , N = 5737)= 144.15, p < .001)[7], the figure has remained stable since 2008. Females more frequently perceived alcohol as a 'very' or 'extremely important' risk factor for cancer than males in 2012 (41.9% vs 31.1%) ($\chi 2$ (df =1 , N = 2901) = 28.1, p < .001).

[7] There were insufficient data in 2004 to control for clustering in this statistic, however the difference in proportions was large enough (14.5% difference) at the population level so as not to be of concern

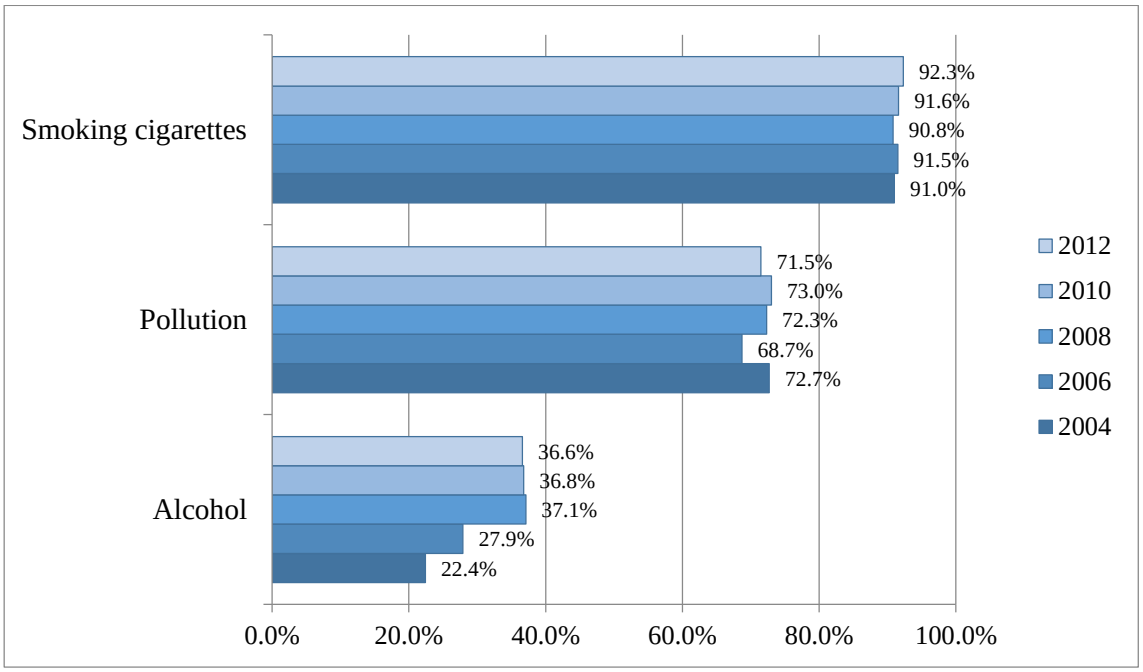


Figure 1. *Perceptions of the link between various factors and cancer 2004-2012 (aged 18 years and over).*

Predictors of drinking in excess of the 2009 NHMRC guidelines

Household income and failure to perceive alcohol consumption as a risk factor for cancer predicted non-compliance with guidelines. Table 3 shows that for males aged 18 years and over failure to comply was related to being separated, divorced or never married and having a self-reported household income of $160,000 or more per annum. Men with bachelor degrees were less likely to drink in excess of the guidelines, as were men that were students or aged 68 years and over. Those that did not perceive alcohol as 'very' or 'extremely important' in increasing a person's risk of cancer were more likely to drink in excess of the guideline. By contrast, knowledge of the guidelines alone (i.e. without context like decreasing cancer risk) did not appear to make a difference, nor did socio-economic status and thus is not shown. The model was significant ($p<0.001$) and was a good fit ($n=2470$, $F(9,759)=0.86$, $p=0.56$) as judged according to the guidance of Archer, Lemeshow and Hosmer (which tests for lack of fit) (Archer, Lemeshow, & Hosmer, 2007).

Table 4 reports the same analysis for women over 18. As with males, females that were separated, divorced or never married were more likely to drink in excess of the relevant guidelines as were those in a de facto relationship. The relationship between drinking to excess and higher income was evident at a lower income level; those with a self-reported household income of $80,000 or over drank in excess of guidelines. Similar to men, women aged 68 years and over were less likely to drink to excess. Women that did not perceive alcohol as ‘very’ or ‘extremely important’ in increasing a person’s risk of cancer were more likely to drink in excess of the guideline. Knowledge of the guidelines for increased lifetime risk themselves, disadvantage status and work status, did not appear to make a difference, and thus are not shown. The model was significant, $p<0.001$ and was a good fit ($n=3422$, $F(9,797)=1.15$, $p=0.33$).

Table 3. *Logistic regression analysis: significant predictors of drinking in excess of NHMRC guidelines for males aged 18 years and over, 2011 & 2012 (Level 1 as ref cat)*

Predictor^	B	SE	Wald	Odds Ratio	(95% conf int)
Constant	-0.99	0.26	**9.20****	NA	NA
Marital status					
Married (ref)	NA	NA	NA	1.00	NA
De facto	0.35	0.17	3.58	1.42	1.02-1.98
Separated/divorced	0.67	0.16	**16.78*****	1.95	1.44-2.64
Widowed	-0.03	0.22	0.32	0.97	0.63-1.50
Never married	0.45	0.16	**6.69****	1.57	1.15-2.15
Not stated	0.94	1.27	0.04	2.57	0.21-31.00
Education					
Left school before 15(ref)	NA	NA	NA	1.00	NA
Left school after age 15	0.04	0.19	0.24	1.04	0.71-1.51
Trade qualification	0.12	0.18	0.36	1.13	0.79-1.61
Certificate/diploma	-0.13	0.19	0.19	0.88	0.61-1.27
Bachelor degree	-0.48	0.21	**3.58***	0.62	0.41-0.93
Not stated	-1.20	1.21	0.22	0.30	0.03-3.24
Income					
Up to $40,000 (ref)	NA	NA	NA	1.00	NA
$40,001-$80,000	0.19	0.16	0.95	1.21	0.89-1.65
$80,001-$120,000	0.27	0.19	1.83	1.31	0.90-1.91
$120,001-$160,000	0.16	0.22	0.52	1.17	0.75-1.82
$160,001 and over	0.86	0.23	**18.22*****	2.36	1.49-3.73
Not stated	-0.16	0.16	2.44	0.86	0.63-1.17
Work status					
Full time (ref)	NA	NA	NA	1.00	NA
Part time	-0.09	0.19	0.37	0.91	0.63-1.32
Unemployed	-0.64	0.29	2.11	0.53	0.30-0.92
Retired	0.15	0.21	0.93	1.16	0.77-1.76
Student	-1.08	0.33	**12.05****	0.34	0.18-0.65
Other	-0.93	0.24	**14.82*****	0.39	0.25-0.63
Age groups					
18-27 years (ref)	NA	NA	NA	1.00	NA
28-37 years	-0.06	0.20	1.34	0.94	0.64-1.38
38-47 years	-0.18	0.20	4.78	0.84	0.57-1.24
48-57 years	0.01	0.22	1.29	1.01	0.66-1.54
58-67 years	-0.18	0.23	4.32	0.83	0.53-1.30
68 years and over	-0.79	0.29	**14.77*****	0.45	0.25-0.80
Risk perception (alcohol)					
Very/extremely important (ref)	NA	NA	NA	1.00	NA
Other	0.45	0.11	**21.29*****	1.56	1.26-1.95

^ Univariate analysis of consumption by disadvantage quintiles were not significant (p>0.05) and therefore not entered into the logistic regression model. Backwards elimination method removed 'knowledge of recommended drinks per day for men' from the final model.

Collinearity was tested between all demographic variables and was found not to be of concern

*** p<0.001, **p<0.01, * p<0.05

Table 4. *Logistic regression analysis: significant predictors of drinking in excess of NHMRC guidelines for females aged 18 years and over, 2011 & 2012 (Level 1 as ref cat)*

Predictor^	B	SE	Wald	Odds Ratio	(95% conf int)
Constant	-2.99	0.29	**105.40*** **	NA	NA
Marital status					
Married (ref)	NA	NA	NA	1.00	NA
De facto	0.75	0.18	**17.32*** **	2.12	1.49-3.01
Separated/divorced	0.48	0.19	**6.26***	1.62	1.11-2.37
Widowed	0.18	0.26	0.51	1.20	0.73-1.98
Never married	0.98	0.19	**27.16*** **	2.67	1.84-3.87
Income					
Up to $40,000 (ref)	NA	NA	NA	1.00	NA
$40,001-$80,000	0.29	0.21	1.90	1.33	0.88-2.01
$80,001-$120,000	0.60	0.22	**7.69****	1.83	1.19-2.81
$120,001-$160,000	0.82	0.28	**8.61****	2.26	1.31-3.91
$160,001 and over	0.84	0.28	**8.90****	2.33	1.33-4.06
Not stated	0.20	0.20	1.05	1.22	0.83-1.81
Age groups					
18-27 years (ref)	NA	NA	NA	1.00	NA
28-37 years	-0.08	0.24	0.10	0.93	0.58-1.48
38-47 years	0.002	0.23	0.00	1.00	0.64-1.57
48-57 years	0.18	0.24	0.56	1.20	0.75-1.91
58-67 years	0.26	0.25	1.05	1.30	0.79-2.14
68 years and over	-0.70	0.33	**4.48***	0.50	0.26-0.95
Risk perception (alcohol)					
Very/extremely important (ref)	NA	NA	NA	1.00	NA
Other	0.29	0.13	**4.93***	1.34	1.03-1.74

^ Univariate analysis of consumption by quintiles of disadvantage were not significant (p>0.05) and therefore not entered into the logistic regression model. Backwards elimination method removed 'work status' 'qualifications' and 'knowledge of recommended drinks per day for women' from the final model.

Collinearity was tested between all demographic variables and was found not to be of concern

*** p<0.001, **p<0.01, * p<0.05

DISCUSSION

This study explored predictors of drinking in excess of current (2009) NHMRC alcohol guidelines for increased lifetime risk. Specifically, knowledge of the guideline consumption threshold, perceptions of the link between alcohol consumption and cancer, and socio-economic status were explored for their statistical association with consumption in adult South Australian men and women.

The results indicated that men were nearly three times more likely to drink in excess of the NHMRC guidelines on an average daily basis than women. It is concerning that over one third of men drink in excess of the NHMRC guidelines with more than one in 10 men drinking four drinks or more per day, putting them at increased risk. Whilst the epidemiology is unclear around patterns of consumption and cancer, these results show that communication strategies that focus particularly on men are warranted.

In terms of awareness of the NHMRC guidelines, this study has confirmed other findings internationally in developed countries (Bendtsen et al., 2011; de Visser & Birch, 2012; Sellman & Ariell, 1996) and recently in Australia (Livingston, 2012); that awareness is low, with over one third reporting not knowing what the guideline consumption threshold is. It is also concerning that over one third of men and women still believe that men can consume up to four standard drinks per day. This suggests that the 2001 guidelines may still be widely believed to be relevant. As highlighted previously, a concerted campaign conducted in Denmark (Gronbaek et al., 2001) was successful in increasing community awareness of guideline changes and, although behaviour change was not measured, a recent Australian study of young people showed that accurate understanding of the guidelines resulted in lower reported risky-drinking behaviour (Bowring et al., 2012). These findings together indicate that a development and roll-out of a strategy to promote the 2009 NHMRC guideline consumption thresholds are warranted.

Community perceptions of the link between tobacco smoking and cancer were very high in 2012 (over 90%), but population knowledge of the link with alcohol was far lower. In 2004, 22.4% indicated knowledge of the link, and this had risen markedly to 36.9% by 2012, a figure still far short of 90%. The fact that females were more likely to perceive alcohol as a risk factor for cancer may be a reflection of the emphasis on breast cancer, for which alcohol is a risk factor, in public discourse. It is also concerning that pollution, a factor with far lower risk and also mostly external to one's own control, was perceived by many more people (approximately 72%) to be a risk factor. These findings support the argument by Nelson et al. (2013) that there is a need for clear and consistent statements by public health and medical organisations to inform the community that alcohol is a known human carcinogen and that alcohol use should be lowered or avoided to reduce cancer risk (Nelson et al., 2013).

Examination of the predictors of consumption revealed some findings that may inform future messaging strategies. It was interesting to note that higher household income (particularly among females) predicted consumption in excess of the guidelines. This is inconsistent with many other health behaviours that increase cancer risk, specifically, smoking and energy-dense food consumption, and warrants further investigation on the interplay between volume of drinking, socio-economic status and cancer and other mortality. It was also interesting that area disadvantage was not a significant predictor, nor was knowledge of the NHMRC guidelines. These findings indicate that knowledge, in isolation, is not sufficient to predict behaviour. Interestingly, and potentially importantly from a health promotion perspective, both men and women who perceived that alcohol was a very or extremely important risk factor for cancer were less likely to drink in excess of the guidelines. These findings, together with the fact that cancer is one of the most feared diseases (Blendon & Georges, 2011; Borland et al., 1994) highlight the possibility that an education campaign to increase awareness of the guidelines (as part of a comprehensive alcohol strategy) is

warranted and could focus on the link between alcohol consumption and cancer. There is significant scope for further research in this area to determine what messages need to be conveyed to make sure that people pay attention and to move rates of overall population consumption of alcohol down.

The findings of this study, together with the compelling evidence that higher levels of alcohol consumption are related to an elevated risk of cancer, support the argument by Fogarty and Chapman (Fogarty & Chapman, 2012) that future advocacy should shift the focus toward better communication of the long-term health risks of consumption and that future research should focus on understanding of the information.

Although this study has made some important contributions it also has a number of limitations that need to be taken into consideration when interpreting the results. One limitation is that the study relied on self-report data, and many studies of alcohol have shown that people tend to underestimate their consumption to a large extent (Kerr, Patterson, Koenen, & Greenfield, 2009), possibly because of social desirability and other response biases. Evidence also shows that there are difficulties in obtaining reliable estimates of actual consumption levels; "serving size" is a concept that is not well understood (Kerr & Stockwell, 2012). A second limitation is that community awareness of the guideline threshold was examined but not awareness of the existence of the guidelines themselves. This was not examined as it is a very difficult to ascertain without leading respondents into responses. A third limitation is that because it is a cross-sectional study design, causality cannot be determined, but only associations.

A fourth limitation is that this study does not examine other cognitive factors that underpin drinking behaviour and drinking choices. Although it may be important to increase knowledge and also to couple this with the message of the link between alcohol and cancer, there may be other more important predictors of alcohol consumption at play among adults

including socialisation, cultural factors, and utilisation of alcohol for self-relaxation and medication (Hall et al., 1992).

In conclusion, the results of this study indicate that many men and, to lesser extent, women drink in excess of the NHMRC guidelines putting themselves at long-term health risk for chronic disease, including cancer. Awareness of the important link between alcohol and cancer is currently very low in the South Australian community, as is awareness of the current NHMRC guidelines. The results of this study indicate that a communication campaign aimed at increasing awareness of the NHMRC guidelines is warranted although, in isolation, it may not promote behaviour change. However coupled with the message that higher alcohol consumption elevates the risk of some forms of cancer, it may serve to promote behaviour change at the population level and reduce the burden of disease attributable to alcohol in Australia. The findings of this study are timely given that the Commonwealth Government has not yet embarked on an extensive communication campaign to increase awareness of the guidelines.

CHAPTER 3: PAPER TWO

3.1 Preamble

The results in the first study indicated that awareness of alcohol consumption as an important risk factor for cancer was low (at 36.6% in 2011/12), albeit an increase from 22.4% in 2004. In addition, when study participants were aware of this link, they were less likely to exceed the alcohol guidelines linked to increased lifetime harm. This result has important implications for practice, indicating that messages highlighting the link between alcohol and cancer may provide some impetus for moderation of intake at the population level.

In order to determine whether this knowledge and its association with consumption were evident in a younger sample, school students were surveyed. Little research has assessed awareness of the link between alcohol and cancer in young people, and no research has investigated its relationship with consumption among adolescents.

In addition to awareness of the link between alcohol and cancer being measured, other potentially important factors were measured. Consistent with the social development model, alcohol consumption in young people is also influenced by parents and peers. It was hypothesised that perceived parental influence would be protective in earlier years and perception of peer approval of drinking would predict consumption in later school years. A population survey was chosen to ensure the results were generalisable to the broader Australian community.

Prevalence, perceptions and predictors of alcohol consumption and abstinence among South Australian school students: a cross-sectional analysis

Published paper[8]

3.2 Statement of authorship

Principal author

Name of Principal Author (Candidate)	Jacqueline Bowden		
Contribution to the Paper	I was responsible for primary authorship of this paper, and led its conceptualisation and design in collaboration with co-authors. I conducted the statistical analyses, and took the lead role in interpreting the results and writing and revising the manuscript. I served as corresponding author and was responsible for manuscript submission, revisions, and responses to journal reviews.		
Overall percentage (%)	80		
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
Signature		Date	24 August 2018

Co-author contributions

By signing the Statement of Authorship, each author certifies that:

i. the candidate's stated contribution to the publication is accurate (as detailed above);
ii. permission is granted for the candidate in include the publication in the thesis; and
iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Professor Carlene Wilson
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I also provided advice on responding to comments by the journal reviewers and editor.

[8] Bowden J, Delfabbro P, Room R, Miller C, Wilson C. (2017). Prevalence, perceptions and predictors of alcohol consumption and abstinence among South Australian school students: a cross-sectional analysis. *BMC Public Health*, 17, 549-559.

Signature		Date	25 August 2018

Name of Co-Author	Professor Robin Room		
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I also provided advice on responding to comments by the journal reviewers and editor.		
Signature		Date	25 August 2018

Name of Co-Author	Professor Paul Delfabbro		
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I also provided advice on responding to comments by the journal reviewers and editor.		
Signature		Date	25 August 2018

Name of Co-Author	A/Professor Caroline Miller		
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I also provided advice on responding to comments by the journal reviewers and editor.		
Signature		Date	25 August 2018

3.3 Paper two

ABSTRACT

Background: Alcohol consumption by young people (particularly early initiation) is a predictor for poorer health in later life. In addition, evidence now clearly shows a causal link between alcohol and cancer. This study investigated prevalence, predictors of alcohol consumption among adolescents, including perceptions of the link between alcohol and cancer, and the role of parents and peers.

Methods: A sample of Australian school students aged 12-17 years participated in a survey (n=2,885). Logistic regression analysis was undertaken to determine predictors.

Results: Alcohol use increased with age and by 16, most had tried alcohol with 33.1% of students aged 12-17 reporting that they drank at least occasionally (95% CI=31.0-35.2). Awareness of the link between alcohol and cancer was low (28.5%). Smoking status and friends' approval were predictive of drinking, whereas parental disapproval was protective. Those aged 14-17 who did not think the link between alcohol and cancer was important were more likely to drink, as were those living in areas of least disadvantage. The only factors that predicted recent drinking were smoking and the perception that alcohol was easy to purchase.

Conclusions: An education campaign highlighting the link between alcohol and cancer may have positive flow-on effects for young people, and schools should incorporate this messaging into any alcohol education programs. Consideration should be given to factors that serve to regulate under-aged accessibility of alcohol.

BACKGROUND

Alcohol consumption is responsible for approximately 3.3 million deaths annually, and accounts for 5.1% of the global burden of disease. Harmful consumption of alcohol has been ranked among the top five risk factors for non-communicable disease, disability and death globally and has been causally linked to over 200 health conditions including cancer (World Health Organization, 2018a). In 1988, alcoholic beverages were classified as a class 1 carcinogen (International Agency for Research on Cancer, 1988), and a large body of evidence now demonstrates the causal link between alcohol consumption and cancer (World Cancer Research Fund and American Institute for Cancer Research, 2007). Alcohol consumption is therefore a topic of considerable public health concern internationally.

A recent Australian study estimated that over 5,500 Australian deaths are attributable to alcohol each year (Gao et al., 2014). Among males, injury was held responsible for 36% of these deaths, followed by cancers (25%) and digestive diseases (16%). Among females the highest proportion of alcohol-attributable deaths was from cardiovascular diseases (34%), followed by cancers (31%) and injuries (12%) (Gao et al., 2014). There is now convincing evidence that alcohol causes cancer of the mouth, pharynx, larynx, oesophagus, bowel (in men) and breast cancers among women. There is also probable evidence that alcohol increases the risk of bowel cancer in women and liver cancer (World Cancer Research Fund and American Institute for Cancer Research, 2007). There is a dose-response relationship between alcohol and cancer risk with increasing consumption associated with increased risk (Corrao et al., 2004; World Cancer Research Fund and American Institute for Cancer Research, 2007). For this reason, Cancer Councils are now recommending that ‘to reduce their risk of cancer, people limit their consumption of alcohol, or better still avoid alcohol altogether’ (Winstanley et al., 2011). It is possible that these estimates may be updated and increased over time with more emerging evidence of the link between alcohol and cancer.

Drinking patterns tend to be laid down in adolescence and early adulthood (McCambridge, McAlaney, & Rowe, 2011). Consumption by young people, particularly early initiation (i.e. for those aged 11 to 14 years), is a predictor of poorer health in later life (DeWit, Adlaf, Offord, & Ogborne, 2000). There has been a decline in alcohol consumption among adolescents in Australia, particularly in the last decade (White & Bariola, 2012a), Europe and the US (de Looze et al., 2015; Johnston, 2013). Despite this, alcohol remains one of the most commonly used intoxicating substances among school students. It is important to note that while the number of current drinkers has decreased, the rate of consuming more than four drinks on one occasion in the past 7 days has not decreased among current drinkers (White & Bariola, 2012a). Research in 2011 suggested that 50.7% of Australian secondary school students had consumed alcohol in the past year. Rates of drinking regularly increase with age from 5.1% at age 12 to 36.7% by age 17 (White & Bariola, 2012b).

Improving community understanding of lifestyle risk factors associated with cancer has been identified as a key strategy for preventing cancer globally (World Health Organization, 2004). Cancer is one of the most feared diseases in Australian adults (Borland et al., 1994), and internationally (Blendon & Georges, 2011). Improving awareness of the link between alcohol and cancer therefore may well influence an individual to consider moderation of their consumption or even abstinence. However, international evidence shows that the majority of people are not aware of the link between alcohol and cancer (Hawkins et al., 2010; Redeker et al., 2009; Sanderson et al., 2009). This is the case in Australia, with a recent study finding that only 36.6% of adults were aware of the important link. This study also found that those that were aware of the risk were less likely to drink beyond the health guidelines threshold for increased lifetime risk (Bowden, Delfabbro, Room, Miller, & Wilson, 2014). Only a few studies have examined awareness among young people, with a study in the UK finding that 37% of young people aged 15 to 24 years were aware of the link (Redeker et

al., 2009). To our knowledge, awareness of the link between alcohol and cancer has not previously been examined among secondary school students in Australia.

Understanding adolescents' reasons for drinking is critical for developing intervention strategies. The Social Development Model postulates influence from social controls, social learning and patterns of association (whereby attitudes and anti-social behaviours are acquired through interaction with others) as important predictors of poor and good behavioural choices in adolescence (Catalano, 1996). Consistent with this model, alcohol consumption in young people has been associated with parental attitudes toward consumption (Kloep et al., 2001), peer use, and perceptions of peer attitudes to alcohol use (Cleveland & Wiebe, 2003). According to this model, the influence of peers becomes increasingly important in later adolescence, at which time parental involvement and the influence of family declines (Catalano, 1996). The role of peer influence, particularly in later adolescence has been supported in both theory and empirical alcohol studies (Wood, Read, Mitchell, & Brand, 2004).

Alcohol consumption among school children has been associated with a number of other covariates, including: more weekly spending money (Bellis et al., 2007); self-reported academic difficulty among females (Balsa, Giuliano, & French, 2011); and participation in other risk-taking behaviours including smoking (Myers & Kelly, 2006). The relationship between alcohol consumption and socio-economic status (SES) is less clear than it is with other risk factors for cancer. People with higher SES tend to drink more frequently than others, but among those that drink, the lower socio-economic groups tend to drink larger quantities (Huckle, You, & Casswell, 2010).

The first aim of this study is to confirm currently documented prevalence of alcohol consumption and it is hypothesised, that consistent with most recent evidence, there will be a pattern of increasing consumption with age among adolescents. The principle hypothesis is

that the majority of students will not be aware that alcohol causes cancer but among those that are, will be less likely to drink alcohol or be recent drinkers. The second hypothesis of this study was that perceived parental disapproval of alcohol consumption will be protective in early years, and perception of peer approval of drinking will predict consumption in later school years[9].

METHODS

Study population

Data were obtained from a 2011 cross-sectional survey of a representative sample of South Australian secondary students that formed part of a larger cohort, namely the Australian School Students' Alcohol and Drugs survey (ASSAD) monitoring survey. This study was approved by the Human Research Ethics Committee of Cancer Council Victoria (HREC 1013). Parental consent was required prior to their participation because this was a study of minors aged under 18 years of age. All guardians were sent home a consent form to sign which outlined the study purpose and the fact that responses were confidential. They were required to complete it and return it prior to their children commencing their survey. If guardian consent was not obtained, students were not asked to complete the survey.

The data are largely representative of the age levels sampled in the South Australian population. In 2011, a total sampling frame of 145 South Australian schools were approached; of these, 82 declined to participate, giving a final school participation rate of 43.5% (n=63). A random sampling methodology was used to select schools from the Government, Catholic and

[9] Note, final publication print stated hypothesis as 'The second hypothesis of this study is that perceived parental disapproval of alcohol consumption will be a protective factor for consumption in later school years', it should have been listed as outlined in the text above and as consistent with wording on paragraph 3, page 556 of the printed paper, this has been provided to the journal.

Independent schools[10]. Students were then randomly selected from within each identified school. Two samples were drawn to reflect junior students (up to Year 10) and senior students (Years 11-12). Several (16) primary schools were also included in the South Australian sample in order to obtain responses from Year 7 students (the majority of whom are 12 years old).

Participating schools provided the list of students currently enrolled for each of the year levels for which they were selected (junior or senior secondary), and random samples of 20 students (plus 6 replacement students) were identified. Survey researchers then attended the school to administer the pencil and paper questionnaire. Anonymity and confidentiality were emphasised during administration of the survey. A number of strategies were employed to enhance student perceptions of confidentiality, including use of external research staff, administering the survey under test conditions, placing teachers at the front or back of the room, training researchers only to look at questionnaires when asked a question by a student and providing blank envelopes into which students placed and sealed their questionnaires. They answered the survey anonymously and it was completed within one lesson. This was a monitoring survey and a power calculation for the hypotheses tested here was not therefore undertaken before data collection. Nonetheless, the sample size was such as to mitigate this as a limitation, a total of 2,885 students aged between 12 and 17 completed the survey providing sufficient numbers for all between and within age group comparisons.

The national study was coordinated by Cancer Council Victoria, and approved by the Human Research Ethics Committee of Cancer Council Victoria (HREC 1013).

[10] The Australian schooling system consists of primary school (generally for ages 5 to 12 years) and then secondary school (generally age 12 to 17 years). Most Catholic schools are run by their local parish, local diocese and the Catholic education department. The majority of other independent schools have a formal religious affiliation (e.g. Protestant, Jewish, Islamic), while some are non-denominational. Some pursue particular educational philosophies (e.g. Montessori or Steiner educational philosophies). Although all types of school receive federal government support, many independent schools charge fees for attendance.

Measures

Alcohol consumption

The primary dependent variable for this study was current drinking status. Students were asked "At the present time, do you consider yourself: A non-drinker; An occasional drinker; A light drinker; A party drinker; or A heavy drinker?". Responses were coded into non-drinker and drinker (all other categories) for most logistic regression analyses. Drinking status was collapsed to test predictors of committed drinking behaviour versus no or episodic drinking. Students that indicated any consumption were asked to report the number of drinks that they had had in each of the last 7 days. Those that had had at least one drink in the last 7 days were classified as recent drinkers.

Demographic and background variables

Students reported their age and gender and were asked, "During a normal week, how much money do you have available to spend on yourself (e.g. from pocket money, part-time job)?". Response categories were 'none', '$1-$40', '$41-$80', '$81-$120' and '$120 and over'. To assess self-rated performance at school, students were asked "At school work, do you consider yourself: 'a lot above average?', 'above average', 'average', 'below average', and 'a lot below average'". Students were asked to write the number of cigarettes they had each day for each of the last 7 days. Current smokers were classified as those that had smoked at least one cigarette in the past 7 days. Students reported their home postcodes, which were then matched with a corresponding Index of Relative Socio-economic Disadvantage quartile as a measure of neighbourhood socio-economic status (Australian Bureau of Statistics, 2013).

Beliefs about drinking

Using the approach adapted from a previous study (Baghurst et al., 1992), students were asked to rate the importance of alcohol in increasing a person's risk of getting cancer on a five- point scale (1=not at all important, 2=slightly important, 3=moderately important, 4=very important and 5=extremely important). Responses were subsequently grouped into dichotomous categories combining "very" and "extremely important" versus all other responses for analyses.

Students were also asked to rate their agreement (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree) with the following statements: "My parents/guardian would not approve of me drinking" and "My friends would approve of me drinking". Drinkers were also asked to rate agreement with the statement, "Being able to buy alcohol easily encourages me to drink a lot" using the same response format.

Statistical analyses

Statistical analyses were undertaken using StataIC 13.1, the estimating tools of which account for the clustered, stratified survey design by utilising more robust estimates of standard error. Whether a school was a Government School, Catholic School or Independent School defined the strata. Chi-square tests were undertaken to determine univariate associations with 'drinking' i.e. ever (Yes/No) and 'recent drinking' (last 7 days) (Table 2). We undertook logistic regression models to determine predictors of these behaviours, stratified by age, to test the second hypothesis, specifically, that perceived parental disapproval for alcohol consumption will be protective in early years, and perception of peer approval of drinking would add risk in later schooling years. (Tables 3, 4, 5). We then investigated recent drinking as the outcome variable among the sub-sample of drinkers (Table 6). Demographic variables were entered in both models (i.e. test of predictors of drinking

status and test of predictors of drinking recently) at the first step. These included sex, the index of disadvantage, available spending money each week and self-reported ability at school. Smoking status was added at the second step. In the third step, awareness of the link between alcohol and cancer was added to test hypothesis 1, and finally friends' approval and parental disapproval to test hypothesis 2. An additional variable was added into the regular drinkers' status model: 'being able to buy alcohol easily encourages me to drink a lot', in order to determine whether availability was a significant additional predictor.

RESULTS

Alcohol consumption among school students

Table 1 shows drinking status by age and gender. Reports of drinking (occasional through to heavy drinker) increased significantly with age ($\chi 2$ (df= 20, N = 2864) =715.78, $p < .001$) from 7.6% among 12 year olds to 66.3% among 17 year olds. Overall, 33.1% of students aged 12-17 years reported that they drank at least occasionally (95% CI=31.0-35.2). There were more non-drinkers than drinkers among 12-15 year olds, but at 16 years of age the number of drinkers (59.5%) exceeded the number of non-drinkers. There was no significant difference by gender. Overall, 15.0% reported having consumed an alcoholic beverage in the past 7 days; this finding did not differ significantly by gender either (15.3% males and 14.8% females).

Table 1. *Drinking status by age groups and gender*

Drinking status	Males (%)	Females (%)	12-13 year olds (%)	14-15 year olds (%)	16-17 year olds (%)	Total (%)
	n=1453	n=1402	n=968	n=992	n=894	N=2855
Non-drinker	67.4	66.3	91.5	69.4	37.5	66.9
Occasional drinker	16.0	14.9	5.3	16.1	25.7	15.4
Light drinker	3.1	3.5	1.8	3.2	5.1	3.3
Party drinker	12.5	15.0	1.1	10.7	30.8	13.7
Heavy drinker	1.0	0.3	0.3	0.6	1.0	0.6
Total	100.0	100.0	100.0	100.0	100.0	100.0

Perceptions of the link between alcohol and cancer

In total, 28.5% of students rated alcohol as "very important" or "extremely important"[11] in increasing a person's risk of cancer. Males were less likely to rate alcohol as extremely important or very important than females [23.6% vs. 33.5%, $\chi 2$ (df=48, N=2875) =34.4, p<.001]. Table 2 shows that although there was no significant difference in ratings of alcohol as a risk factor for cancer between 12-13 year olds who drank and those who did not, those aged 14-15 and 16-17 who drank were significantly less likely than those who did not drink to rate alcohol as "very important" or "extremely important" in increasing a person's risk of cancer.

[11] Note: the word 'extremely' was omitted from the final print (it was included in methods – page 551) this has been provided to the journal.

Table 2. *Cross-tabulations of various indicators by drinking status (at all drinkers and drank in the last 7 days) by age groups*

	At all drinkers											Drank in the last 7 days among drinkers			
	12 & 13 year olds				14 & 15 year olds				16 & 17 year olds							
	Non-drinker n=886 %	Drinker n=82 %	p	Φc	Non-drinker n=688 %	Drinker n=304 %	p	φc	Non-drinker n=335 %	Drinker n=559 %	p	φc	Didn't drink n=576 %	Drank n=379 %	p	φc
Smoked in last week	0.6	6.9	***	0.17	1.3	11.8	***	0.24	1.7	12.8	***	0.18	5.0	22.5	***	0.26
Index of disadvantage																
1st quintile	17.4	16.3			17.6	22.0			25.5	28.1			23.6	28.0		
2nd quintile	14.4	7.2			17.1	16.7			21.9	22.3			18.2	20.3		
3rd quintile	32.4	40.1			33.4	35.3			23.8	25.7			32.7	25.7		
4th quintile	19.1	16.0			12.8	10.7			14.1	12.8			11.5	13.6		
5th quintile	16.7	20.5	NS	NA	19.1	15.3	NS	NA	14.7	11.1	NS	NA	14.1	12.4	NS	NA
Available spending money per week																
None	18.3	12.2			13.6	5.8			10.4	4.2			6.3	4.2		
$1-$40	69.2	60.1			63.3	55.2			45.4	34.1			45.4	41.2		
$41-$80	4.7	11.8			11.7	17.5			18.2	20.8			19.4	18.3		
$81-$120	2.8	9.7			3.8	8.5			12.3	16.7			13.5	13.1		
$121 and over	5.1	6.3	*	0.12	7.7	13.0	***	0.18	13.7	24.2	***	0.20	15.4	23.3	*	0.09
Self-reported ability at school																
A lot above average	4.4	7.9			6.3	3.7			9.6	3.3			3.9	3.6		
Above Average	35.2	19.0			37.3	30.6			38.9	32.6			31.5	29.8		
Average	52.1	53.3			52.4	56.1			46.5	55.1			56.6	53.5		
Below average	8.1	17.9			3.6	7.8			4.9	7.6			7.0	10.8		
A lot below average	0.2	1.9	**	0.13	0.3	1.8	**	0.14	0.2	1.4	***	0.17	1.0	2.4	NS	NA
Parental disapproval (Strongly/disagreed)	75.3	36.9	***	0.20	75.9	58.7	***	0.18	70.5	45.3	***	0.24	51.3	45.7	NS	NA
Friends approval (strongly/agreed)	22.4	65.6	***	0.25	46.8	85.0	***	0.37	61.7	91.6	***	0.38	87.5	88.3	NS	NA

	At all drinkers											Drank in the last 7 days among drinkers			
	12 & 13 year olds				14 & 15 year olds				16 & 17 year olds							
	Non-drinker n=886 %	Drinker n=82 %	p	Φc	Non-drinker n=688 %	Drinker n=304 %	p	φc	Non-drinker n=335 %	Drinker n=559 %	p	φc	Didn't drink n=576 %	Drank n=379 %	p	φc
Alcohol and cancer (very/extremely important)	28.3	33.7	NS	NA	31.4	23.8	*	0.08	34.2	23.4	***	0.11	26.3	21.7	NS	NA
Being able to buy alcohol easily encourages me to drink a lot													17.8	27.7	***	0.12
Age																
12-13													11.8	6.1		
14-15													31.3	33.4		
16-17													56.9	60.5	NS	NA

*** p≤0.001, **p≤0.01, * p<0.05chi square, NS = Not statistically significant at p<0.05, NA = Not applicable

Predictors of alcohol consumption

A number of the demographic variables and the measures of reported endorsement of drinking by others were significantly related to drinking status at the univariate level (Table 2). There was a clear association between smoking and drinking across all ages. There was no clear association between drinking and the index of disadvantage. Those with more available spending money per week were more likely to drink at all ages as were those with average or below average self-reported ability at school. Parental disapproval was protective from consumption whereas friends' approval was predictive of consumption (at all). Those that thought there was an important link between alcohol and cancer were less likely to drink when aged 14-17 years. Those that agreed that "being able to buy alcohol easily encourages me to drink a lot" were more likely to drink. Overall, 4 models were tested for each of the three age groups (12-13 year olds: Table 3, 14-15 year olds: Table 4 and 16-17 year olds: Table 5).

Among 12-13 year olds, model 1 showed that school children at this age are 3.5 times more likely to drink if they have between $41 and $80 spending money per week, and 4 times more likely to drink if they have between $81 and $120. Gender, socio-economic disadvantage and self-reported schooling ability were not significant influences on drinking. In model 2, smokers were 10 times more likely to drink. Model 3 showed that the addition of awareness of the link between alcohol and cancer did not explain additional variance. Model 4 included friends' approval of drinking and parental disapproval of drinking. The addition of these variables increased the odds ratios for smokers to 15 times more likely to drink and available spending money to 9 times more likely, for those with between $41 and $80 a week, and 13 times for those with $81-$120 per week. Interestingly, the inclusion of these variables resulted in a significant incremental contribution to predicted variance by cancer-alcohol knowledge; those who did not link alcohol and cancer were less likely to drink, a direction

contrary to that hypothesised. Consistent with the hypothesis, those who reported that their friends approved of their drinking were 5 times more likely to drink and those who reported that their parents did not approve of drinking were much less likely to drink.

The picture among 14-15 year olds was very similar, although the influence of schooling ability was significant in this age group. Model 1, Table 4 shows that amount of available spending money increased the odds of drinking by at least 2 times, up to nearly 6 times, for those with between $81 and $120 per week. Those reporting average schooling ability were twice as likely as those that were a lot above average to drink; those that were below average were nearly 6 times and those that reported they were a lot below average were 12 times more likely to drink. Model 2 added smoking status, which did not change the other odds ratios much, but did confirm that smokers were nearly 10 times more likely to drink. Model 3 added awareness of the link between alcohol and cancer, which was significant. The other odds ratios did not change much, but those that did not see alcohol as a very or important risk factor for cancer were about 1.5 times more likely to drink alcohol as those that did see it as a risk, confirming the hypothesis within this age group. Model 4 included friends' approval of drinking and parental disapproval of drinking. The inclusion of these variables reduced the importance of available spending money as a predictor to non-significance, but all other odds ratios remained similar. Consistent with the hypothesis, those who reported that their friends approved of their drinking were 6 times more likely to drink and those who reported that their parents did not support their drinking were less likely to drink.

A similar result was found among 16 and 17 year olds (Table 5). Model 1 showed that available spending money increased the odds of drinking by at least two times, and up to 4.7 times for those getting over $121 per week. Those reporting above average schooling ability were twice as likely as those that were a lot above average to drink; those that were average

were 3.5 times, those below average were 4.4 times and those that reported they were a lot below average were 18 times more likely to drink. Model 2 added smoking status, which did not substantially change the other odds ratios, but removed the effect of being a lot below average ability and indicated that smokers were nearly 9 times more likely to drink than those that did not smoke. Model 3 added awareness of the link between alcohol and cancer, which was significant. The other odds ratios changed very little, but those respondents that did not see alcohol as a very or important risk factor for cancer were 1.7 times more likely to drink alcohol compared to those that did, consistent with the hypothesis. Model 4 included friends' approval of drinking and parental disapproval of drinking. Contrary to the hypothesis, the inclusion of these two variables did not substantially change the other odds ratios but allowed for the detection of gender as a possible predictor in the model. Those that were least disadvantaged were less likely to drink, as were those who reported that their parents did not support their drinking (contrary to that hypothesised for older age groups), while those who reported that their friends approved of their drinking were nearly 7 times more likely to drink.

Predictors for drinking alcohol in the past week (i.e. recent drinking) were also examined (Table 6). Model 1 shows that those aged 14-15 years old were twice as likely as 12-13 year olds to drink in the previous week. Those in the third quintile of disadvantage were less likely to drink regularly than the most disadvantaged group. Those with access to available spending money of $121 and over were also 2.3 times more likely to drink recently than those with no available spending money. Model 2 added smoking status, which was again a strong predictor (nearly 6 times more likely to drink regularly). Contrary to hypothesis one and two, the addition of awareness of the link between alcohol and cancer did not add to the model, nor did friends' approval of drinking and parental disapproval. Finally, those that agreed that 'being able to buy alcohol easily encourages me to drink' were 1.7 times more likely to be recent drinkers.

Table 3. *Logistic regression analysis: significant predictors of drinking alcohol for 12-13 year olds (Level 1 as reference category)*

	Model 1 OR n=950	95% CI	Model 2 OR n=945	95% CI	Model 3 OR n=945	95% CI	Model 4 OR n=525	95% CI
Sex (ref:male)	0.68	0.35-1.33	0.64	0.33-1.25	0.62	0.31-1.22	0.49	0.21-1.15
Index of disadvantage (ref: most disadvantage)								
2nd quintile	0.54	0.11-2.73	0.60	0.12-3.06	0.60	0.12-2.99	0.07	0.00-1.22
3rd quintile	1.25	0.59-2.66	1.46	0.71-3.02	1.46	0.70-3.04	1.10	0.46-2.62
4th quintile	0.94	0.40-2.20	0.93	0.39-2.21	0.95	0.40-2.25	1.50	0.31-7.40
5th quintile	1.35	0.70-2.61	1.61	0.85-3.02	1.62	0.87-3.01	0.63	0.19-2.13
Available spending money per week (ref: none)								
$1-$40	1.28	0.69-2.37	1.34	0.71-2.55	1.36	0.72-2.58	3.18	0.70-14.47
$41-$80	**3.52***	1.13-10.97	**3.82***	1.23-11.83	**3.76***	1.21-11.72	**9.10***	1.72-48.04
$81-$120	**4.12***	1.11-15.26	3.36	0.75-15.12	3.30	0.78-13.96	**13.14****	2.36-73.31
$121 and over	1.63	0.31-8.51	1.72	0.31-9.59	1.77	0.33-9.60	3.73	0.26-53.65
Self-reported ability at school (ref: a lot above average)								
Above average	0.36	0.09-1.38	0.32	0.08-1.18	0.31	0.09-1.16	**0.16***	0.03-0.74
Average	0.61	0.17-2.20	0.57	0.17-1.97	0.58	0.17-2.01	0.45	0.10-2.09
Below average	1.17	0.26-5.31	0.91	0.22-3.76	0.92	0.22-3.92	0.84	0.17-4.27
A lot below average	4.15	0.29-59.97	1.34	0.16-11.52	1.33	0.16-11.44	0.66	0.04-9.69
Smoked in last week (ref: no)			**10.33****	2.87-37.16	**10.64****	3.02-37.46	**15.04***	1.97-114.79
Alcohol and cancer (ref: very/extremely important)					0.77	0.41-1.44	**0.42***	0.18-0.97
Friends approval (ref: no)							**6.02****	1.91-18.93
Parental disapproval (ref: no)							**0.25****	0.11-0.55

***p≤0.001, **p≤0.01, *p<0.05

Table 4. *Logistic regression analysis: significant predictors of drinking alcohol for 14-15 year olds (Level 1 as reference category)*

	Model 1 OR n=961	95% CI	Model 2 OR n=956	95% CI	Model 3 OR n=956	95% CI	Model 4 OR n=598	95% CI
Sex (ref:male)	1.04	0.74-1.48	1.06	0.75-1.51	1.10	0.78-1.57	1.42	0.90-2.23
Index of disadvantage (ref: most disadvantage)								
2nd quintile	0.76	0.42-1.39	0.80	0.44-1.44	0.81	0.44-1.47	0.88	0.41-1.89
3rd quintile	0.80	0.48-1.33	0.79	0.47-1.33	0.80	0.47-1.37	0.70	0.36-1.35
4th quintile	0.70	0.42-1.14	0.66	0.42-1.04	0.67	0.42-1.06	0.89	0.53-1.49
5th quintile	0.66	0.40-1.08	0.66	0.41-1.06	0.66	0.41-1.07	**0.49***	0.25-0.97
Available spending money per week (ref: none)								
$1-$40	**2.13***	1.19-3.82	**2.05***	1.15-3.63	**2.01***	1.13-3.57	1.37	0.68-2.76
$41-$80	**3.71****	1.86-7.43	**3.65****	1.80-7.42	**3.64****	1.77-7.53	2.05	0.75-5.63
$81-$120	**5.76*****	3.28-10.12	**5.52*****	3.27-9.32	**5.22*****	3.11-8.77	2.18	0.91-5.24
$121 and over	**4.31*****	2.32-7.99	**4.47*****	2.40-8.32	**4.43*****	2.41-8.15	1.81	0.75-4.36
Self-reported ability at school (ref: a lot above average)								
Above average	1.79	0.80-3.99	1.72	0.78-3.79	1.74	0.79-3.84	2.38	0.85-6.64
Average	**2.27***	1.13-4.54	**1.98***	1.01-3.86	1.92	0.98-3.74	1.92	0.70-5.24
Below average	**5.82*****	2.41-14.02	**4.47****	1.80-11.10	**4.29****	1.73-10.66	**4.33***	1.20-15.67
A lot below average	**12.45***	1.76-87.91	6.09	0.75-49.31	5.94	0.69-51.48	0.42	0.05-3.56
Smoked in last week (ref: no)			**9.91*****	3.96-24.81	**9.96*****	3.96-25.08	**10.07****	2.49-40.68
Alcohol and cancer (ref: very/extremely important)					**1.43****	1.05-1.94	**1.65***	0.99-2.74
Friends approval (ref: no)							**6.25*****	4.22-9.27
Parental disapproval (ref: no)							**0.56****	0.37-0.84

***p≤0.001, **p≤0.01, *p<0.05

Table 5. *Logistic regression analysis: significant predictors of drinking alcohol for 16-17 year olds (Level 1 as reference category)*

	Model 1 OR n=874	95% CI	Model 2 OR n=871	95% CI	Model 3 OR n=871	95% CI	Model 4 OR n=641	95% CI
Sex (ref:male)	1.16	0.84-1.61	1.15	0.82-1.62	1.23	0.87-1.74	1.54*	1.01-2.32
Index of disadvantage (ref: most disadvantage)								
2nd quintile	0.98	0.63-1.53	1.03	0.66-1.62	1.04	0.67-1.61	1.32	0.78-2.22
3rd quintile	1.00	0.66-1.52	0.95	0.63-1.43	0.93	0.63-1.38	0.90	0.55-1.48
4th quintile	0.87	0.55-1.39	0.90	0.56-1.46	0.92	0.57-1.47	0.71	0.42-1.19
5th quintile	0.76	0.45-1.26	0.79	0.48-1.30	0.76	0.47-1.24	**0.50****	0.31-0.78
Available spending money per week (ref: none)								
$1-$40	**1.98****	1.20-3.26	**2.08****	1.23-3.48	**2.12****	1.25-3.61	**2.18***	1.21-3.91
$41-$80	**3.04*****	1.79-5.19	**3.33*****	1.99-5.57	**3.38*****	2.00-5.74	**3.03****	1.57-5.82
$81-$120	**3.47****	1.76-6.83	**3.38****	1.68-6.83	**3.41*****	1.68-6.92	**2.57***	1.21-5.43
$121 and over	**4.67*****	2.60-8.39	**4.99*****	2.77-8.96	**4.97*****	2.73-9.03	**4.78*****	2.32-9.84
Self-reported ability at school (ref: a lot above average)								
Above average	**2.42***	1.18-4.97	**2.35***	1.18-4.68	**2.29***	1.13-4.63	1.81	0.94-3.48
Average	**3.52****	1.75-7.09	**3.27****	1.65-6.48	**3.08****	1.53-6.16	**2.73****	1.37-5.45
Below average	**4.40****	1.91-10.12	**3.74****	1.67-8.36	**3.30****	1.42-7.69	**3.63***	1.13-11.56
A lot below average	**18.15***	1.48-221.91	9.25	0.62-137.07	9.73	0.63-149.41	-	-
Smoked in last week (ref: no)			**8.97*****	4.52-17.82	**8.94*****	4.52-17.67	**7.88*****	3.09-20.10
Alcohol and cancer (ref: very/extremely important)					**1.68****	1.24-2.29	**1.82****	1.23-2.69
Friends approval (ref: no)							**6.94*****	4.19-11.49
Parental disapproval (ref: no)							**0.41*****	0.29-0.57

***p≤0.001, **p≤0.01, *p<0.05

Table 6. *Logistic regression analysis: significant predictors of drinking alcohol in the last 7 days among drinkers (Level 1 as reference category)*

	Model 1 OR n=931	95% CI	Model 2 OR n=926	95% CI	Model 3 OR n=926	95% CI	Model 4 OR n=690	95% CI	Model 5 OR n=619	95% CI
Age (ref 12-13 year olds)										
14-15 year olds	**2.09***	1.01-4.36	1.90	0.95-3.80	1.88	0.94-3.76	1.38	0.55-3.44	1.44	0.48-4.30
16-17 year olds	1.91	0.99-3.70	1.65	0.88-3.12	1.64	0.87-3.09	1.19	0.51-2.78	1.25	0.43-3.63
Sex (ref: male)	1.01	0.79-1.30	1.08	0.82-1.41	1.09	0.83-1.42	0.96	0.71-1.30	0.94	0.68-1.30
Index of disadvantage (ref: most disadvantage)										
2nd quintile	0.97	0.64-1.47	1.00	0.65-1.52	1.00	0.65-1.53	1.03	0.61-1.71	0.91	0.52-1.59
3rd quintile	**0.67***	0.49-0.93	**0.62***	0.44-0.87	**0.62****	0.44-0.88	0.76	0.51-1.12	0.76	0.52-1.10
4th quintile	1.09	0.66-1.79	1.13	0.69-1.85	1.13	0.69-1.85	1.19	0.70-2.02	1.07	0.59-1.92
5th quintile	0.82	0.49-1.38	0.87	0.51-1.48	0.87	0.51-1.48	1.04	0.53-2.06	0.91	0.45-1.86
Available spending money per week (ref: none)										
$1-$40	1.40	0.76-2.57	1.58	0.80-3.13	1.58	0.80-3.12	1.23	0.56-2.70	1.05	0.46-2.38
$41-$80	1.46	0.70-3.04	1.71	0.76-3.89	1.71	0.75-3.89	1.39	0.54-3.54	1.29	0.51-3.30
$81-$120	1.45	0.73-2.86	1.48	0.70-3.10	1.48	0.70-3.10	1.18	0.49-2.84	0.94	0.41-2.15
$121 and over	**2.35****	1.24-4.42	**2.79****	1.38-5.60	**2.78****	1.38-5.58	**2.56***	1.10-5.95	1.89	0.82-4.33
Self-reported ability at school (ref: a lot above average)										
Above average	0.89	0.51-1.54	0.86	0.48-1.54	0.86	0.48-1.54	0.86	0.40-1.84	0.78	0.35-1.75
Average	0.91	0.47-1.76	0.79	0.39-1.60	0.79	0.39-1.59	0.76	0.32-1.82	0.58	0.23-1.43
Below average	1.64	0.77-3.50	1.23	0.55-2.76	1.22	0.55-2.72	0.97	0.35-2.72	0.81	0.29-2.30
A lot below average	2.37	0.71-7.90	1.13	0.39-3.31	1.14	0.39-3.32	0.82	0.18-3.75	0.62	0.12-3.34
Smoked in last week (ref: no)			**5.89*****	3.36-10.34	**5.86*****	3.33-10.31	**5.17*****	2.72-9.84	**4.00*****	2.11-7.56
Alcohol and cancer (ref: very/extremely important)					1.09	0.77-1.55	1.11	0.75-1.65	1.13	0.75-1.70
Friends approval (ref: no)							1.08	0.62-1.86	1.04	0.60-1.79
Parental disapproval (ref: no)							0.74	0.54-1.01	0.74	0.54-1.02
Being able to buy alcohol easily encourages me to drink a lot (ref: no)									**1.70***	1.09-2.65

***p≤0.001, **p≤0.01, *p<0.05

DISCUSSION

The first aim of this study was to confirm the prevalence of alcohol consumption. A pattern of increasing consumption with age, reported in previous literature, was observed in our data. By 16 years of age the number of drinkers exceeded the number of non-drinkers.

The first hypothesis of the study was that the majority of students would not be aware that alcohol causes cancer but this was only partially supported with results varying between age groups and outcomes. Overall, the results revealed that, as hypothesised, awareness of the link was low, with only one in four or 28.5 percent of students being aware. These figures were lower than those obtained in a recent survey of Australian adults (36.6%) (Bowden et al., 2014), and of the finding in the UK that 37% of young people aged 15 to 24 years were aware of the link (Redeker et al., 2009). It is important to note that since this study was undertaken, awareness may have increased as evidence of a clear link between alcohol and cancer has improved and dissemination increased. It is beyond the scope of this study to investigate paid and unpaid media on this topic, but it warrants further research and a follow-up study should be undertaken.

Consistent with previous research involving adults (Bowden et al., 2014), results indicated that awareness of the cancer link discriminated ‘no consumption ever’ from ‘any consumption’, although, paradoxically, we found no relationship between awareness and recent consumption. It is possible that such a relationship (even though it may be small) might exist among recent drinkers, but that low levels of recent consumption in the current sample, notwithstanding the large sample size, obscured this relationship. It was also interesting to note that while awareness of the link between alcohol and cancer was protective against drinking in the 14-17 year olds, the inverse relationship was found for 12-13 year olds. This may be a statistical anomaly or may indicate that awareness of the link between alcohol and cancer becomes more important with age.

The second hypothesis of this study was that perceived parental disapproval for alcohol consumption will be protective in early years, and perception of peer approval of drinking will predict consumption in later school years. The results indicated that students' perceptions of parental disapproval was predictive of drinking at all mid-teen ages (i.e. where a student reported that a parent did not disapprove, a student was more likely to consume alcohol). This contrasts with predictions based on Social Development Theory that parental attitudes would have reduced importance with increasing adolescent age. Moreover, also in contrast with theory, perceptions of peer attitudes to alcohol was a significant predictor regardless of age.

As expected, and consistent with previous studies (Myers & Kelly, 2006), smoking was strongly related to alcohol consumption across ages. It would be interesting to explore whether the awareness of cancer-alcohol risk differs for smokers and non-smokers because it is possible that smokers may weigh cancer risk less heavily in their decision-making. Also consistent with the literature, available spending money per week (Bellis et al., 2007) and self-reported average or below-average school achievement were predictive of drinking (Balsa et al., 2011). Interestingly, however, when non-drinkers were removed from the model, the only significant predictors of drinking within the previous week were smoking status and the perception that 'being able to buy alcohol easily encourages me to drink a lot'. This result presents some difficulty for interpretation given that ease might relate to any one or more of financial ease, physical accessibility, or parental attitude. Further research should examine the drivers of self-reported ease of access.

The strengths of the current study include the large sample size and the fact that data were weighted to reflect the South Australian school student population, increasing confidence in the generalisability of the findings. There are, however, some limitations. The survey was cross-sectional so causation cannot be determined. In addition, the study relies on

self-report of drinking identity rather than actual behaviour; this can be subject to bias, although anonymity was assured to reduce this potential bias. The study looked at drinking frequency rather than volume of consumption, and amounts consumed should be investigated in future studies. Also, while the questionnaire had face validity its questions have not undergone rigorous reliability and validity testing. The survey was also limited by the small number of predictors able to be included because of cost and time restrictions; we did not assess the role that other factors might play including media, advertising and role modelling.

CONCLUSIONS

The present study demonstrates that consumption of alcohol by adolescents increases with age cross-sectionally. Moreover, consumption can be predicted by adolescent report of parental attitudes towards drinking, and also by peer attitudes. In light of the findings that early initiation of drinking predicts poorer health in later life (DeWit et al., 2000), the study highlights the importance of parental attitudes to student drinking. It is also interesting to note that those aged 14-17 years with an awareness of the link between alcohol and cancer were less likely to drink, indicating that an education campaign and messaging about the link might impact young people. It would therefore be potentially beneficial for schools to include greater information concerning the longer-term health consequences of drinking in health advice provided during the school years. The study's results also indicate that greater consideration should be given to the factors that serve to regulate accessibility to alcohol among those underage.

CHAPTER 4: PAPER THREE

4.1 Preamble

The results in Chapter 2 indicated that 21.6% of adults in South Australia (33.0% of males and 10.7% of females) drank in excess of the low-risk guideline threshold, putting them at increased risk of long-term harm from alcohol-related disease or injury. In addition, as outlined in Chapter 1, evidence shows that a large majority of alcohol consumption now occurs within the home (Australian Institute of Health and Welfare, 2017).

For the first time in Australia, the results reported in Chapter 3 suggested that perceived parental disapproval is an important correlate of adolescents' consumption: those who felt that their parents would disapprove, were less likely to drink. Given that parents who set rules are less likely to drink to excess, and good role modelling is protective against early initiation and also protective against poorer drinking habits in adolescence, the third study (reported in this fourth chapter) investigates drinking patterns of parents.

This study used data collected through the National Drug Strategy Household Survey (NDSHS) in 2013. The NDSHS collects information on alcohol, tobacco and illicit drug use among the general population in Australia. The survey has been conducted every 2 to 3 years since 1985 and collects responses for over 23,000 Australians each time (Australian Institute of Health and Welfare, 2018). I was granted permission by the data custodians to examine parental alcohol consumption using the existing questions collected in the 2013 study. Analyses were undertaken for 25-55 year olds (n=11,591).

This study aimed to a) assess alcohol consumption patterns among Australian parents compared to non-parents, b) examine places where alcohol is consumed by parents, and c) investigate how these vary by age of the youngest child in the household.

Parental drinking in Australia: does the age of children in the home matter?

Published paper[12]

4.2 Statement of authorship

Principal author

Name of Principal Author (Candidate)	Jacqueline Bowden		
Contribution to the Paper	I was responsible for primary authorship of this paper, and led its conceptualisation and design in collaboration with co-authors. I conducted the statistical analyses, and took the lead role in interpreting the results and writing and revising the manuscript. I served as corresponding author and was responsible for manuscript submission, revisions, and responses to journal reviews.		
Overall percentage (%)	85		
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
Signature		Date	28 August 2018

Co-author contributions

By signing the Statement of Authorship, each author certifies that:

i. the candidate's stated contribution to the publication is accurate (as detailed above);
ii. permission is granted for the candidate in include the publication in the thesis; and
iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Professor Carlene Wilson		
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I also provided advice on responding to comments by the journal reviewers and editor.		
Signature		Date	25 August 2018

[12] Bowden J, Delfabbro P, Room R, Miller C, Wilson C. (2017). Parental Drinking in Australia: Does the age of children in the home matter? *Drug and Alcohol Review*. Nov 2018. E Pub ahead of print.

Name of Co-Author	Professor Robin Room		
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I also provided advice on responding to comments by the journal reviewers and editor.		
Signature		Date	25 August 2018

Name of Co-Author	Professor Paul Delfabbro		
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I also provided advice on responding to comments by the journal reviewers and editor.		
Signature		Date	25 August 2018

Name of Co-Author	A/Professor Caroline Miller		
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I also provided advice on responding to comments by the journal reviewers and editor.		
Signature		Date	25 August 2018

4.3 Paper three

ABSTRACT

Introduction and aims: Parental role modelling of alcohol use is known to influence alcohol consumption in adolescence and in later life. This study aimed to assess relationships between parental status, child age and alcohol consumption, which have not been well documented.

Design and methods: Data were sourced from the 2013 Australian National Drug Strategy Household Survey. Analyses were conducted for 25-55 year olds (n=11,591) by parental status, gender, and age of youngest child in the household, controlling for socio-demographic factors.

Results: Parents were less likely than non-parents to exceed alcohol guideline for increased lifetime risk (18.2% vs 24.2%) and short-term risk: at least weekly (14.2% vs 21.2%); and at least monthly (27.5% vs 35.9%). Fathers were just as likely to exceed the guidelines for lifetime risk as other men, but those with children aged 0-2, were less likely to exceed the guideline for short-term risk. Women were least likely to exceed the guideline for lifetime risk if they had children aged 0-2, 6-11 or 15 years and over, or the guideline for short-term risk, if they had children aged 0-2, or 15 years and over in the household. Parents were more likely to report drinking in the home.

Discussion and conclusion: Parents were less likely to exceed alcohol guidelines than non-parents, especially mothers whose youngest child was an infant or in high school or older. Consistent with population rates in men, fathers were more likely to exceed alcohol guidelines than mothers, and this excess consumption warrants public health attention.

INTRODUCTION

Australians are relatively high consumers of alcohol per capita (World Health Organization, 2018a), with drinking a feature of Australian culture. The latest national survey found that 77% of people aged 14 years or over had consumed alcohol in the past 12 months, with 26% drinking alcohol at levels that placed them at risk of short-term harm from alcohol-related injury and 17% at levels placing them at risk of lifetime harm from alcohol-related disease and injury (refer to the methods section for a full definition) (Australian Institute of Health and Welfare (AIHW), 2017). Furthermore, a recent study found that 73% of the community believe that Australia has a problem with alcohol abuse (Foundation for Alcohol Research and Education, 2018).

Much of the alcohol drunk in Australia is consumed within the home (79%) (Australian Institute of Health and Welfare, 2017). Bandura's Social Learning Theory postulates that children and adolescents learn about what is acceptable behaviour through observation and interacting with those to whom they are closest to (Bandura, 1977). Parental role modelling has been found to be an important factor determining when and how children initiate drinking. Specifically, US studies and a systematic review found that observation of parental alcohol use increases the likelihood of earlier initiation (Getz & Bray, 2005; Hawkins et al., 1997; Peterson et al., 1994; Ryan et al., 2010) and studies from the US, Finland, UK, Netherlands and a systematic review have found that parental consumption affects the amount of later adolescent alcohol consumption (Engels, Knibbe, Vries, Drop, & van Breukelen, 1999; Latendresse et al., 2008; Ryan et al., 2010; Seljamo et al., 2006; Windle, 2000). Early initiation leads to risky alcohol use; the leading cause of death and disability in 15-24 year olds globally (Mokdad et al., 2016). There is also growing evidence that early age of initiation (i.e. before 15 years) is a risk factor for developing alcohol-related problems in later life (Hingson, Heeren, & Winter, 2006). Ameliorating the problems that

flow from early, and often unsupervised, alcohol initiation requires further analysis of parental alcohol consumption patterns and levels.

There has been limited consideration of parental alcohol consumption in Australia. One population survey reported that parents were less likely to drink at risky levels compared to those without dependent children. The study estimated that between 710,000 and 1.4 million Australian parents drink at short-term or long-term risky levels (Maloney et al., 2010). Data from 2013 revealed that a sizeable proportion of Australian parents consume alcohol. Parents were more likely to report being moderate drinkers than non-parents, less likely to report being abstainers, and less likely to report being risky drinkers (Laslett, Jiang, & Room, 2017). However, this study did not examine whether drinking behaviour varied by the age of children in the home, and there is limited research examining this question at the population level. A Finnish study found no difference in alcohol consumption rates of parents by age of the child. However, this null effect may be because the age group categories in the study were large (0-6 years and 7-17 years) and so less sensitive to variation (Raitasalo et al., 2011).

Evidence suggests that becoming a parent is a transitional phase in life, and alcohol consumption may be influenced by this new role. A large majority of women alter their drinking habits once they are trying to conceive or are pregnant (Callinan, 2012). Other than concern for the health of the baby, the fact that it is not socially acceptable to drink while pregnant (Woodward, Fergusson, & Horwood, 2006) may be an influencing factor. There has been limited research conducted on the impact of parenthood on fathers' alcohol consumption across time (Little, Handley, Leuthe, & Chassin, 2009), but some research suggests that parenthood may help with recovery from alcohol dependence (Dawson, Grant, Stinson, & Chou, 2006).

Although the results above suggest that adult alcohol consumption may be influenced by becoming parents, little evidence describes the variables that might moderate or mediate this relationship, including the age of the children. Parents' drinking is likely to influence children through descriptive norms (i.e. role modelling of alcohol consumption) and injunctive norms (rules and expectations about alcohol use) (Mares, van der Vorst, Engels, & Lichtwarck-Aschoff, 2011). A Dutch study found that normative alcohol use among parents is negatively related to setting rules and guidelines for children around alcohol (Spijkerman, van den Eijnden, & Huiberts, 2008). The locations where parents drink are also likely to define descriptive norms. As already noted, the majority of alcohol consumed in Australia is consumed within people's homes, particularly for adults aged 25 years and over. In addition to a person's home being the most common place to drink, the level of consumption within the home was high, predominantly a result of the larger number of drinking occasions rather than drinks per session (Callinan et al., 2016). As parents often have restrictions on their ability to socialise outside the home (e.g. having to arrange for babysitters to care for their children), the present study aimed to investigate whether age of the children impacted parents consumption of alcohol within the home. A Canadian study investigated this and concluded that it may not be the parental role that structures drinking, but the fact that parents (given their parental responsibilities) were restricted in access to bars, discos and hotels, where drinking tends to be heavy (Paradis, 2011).

This study was designed to a) compare alcohol consumption patterns between Australians with and without children, b) compare parent consumption between locations, and c) determine the impact of age of youngest child in the household. The youngest child was chosen because research has shown that alcohol consumption reduces for women when they are breastfeeding (Wilson et al., 2017), suggesting that this age, and the early years, may be critical.

The following hypotheses were tested:

Hypothesis 1: Parents will be less likely to exceed Australian alcohol guideline thresholds than adults without children

Hypothesis 2: Fathers will be more likely to exceed Australian alcohol guideline thresholds than mothers

Hypothesis 3: Mothers whose youngest child is an infant (0-2 years old), will be more likely to abstain than mothers with older children, and

Hypothesis 4: Parents, particularly those with younger children, will be more likely to consume alcohol in the home than adults without children.

METHODS

Data and procedure

This paper utilised data collected as part of the 2013 National Drug Strategy Household Survey (NDSHS). The NDSHS is undertaken by the Australian Institute of Health and Welfare (AIHW) and assesses illicit and licit drug use in a representative sample of the population aged 12 and above. Households were selected in a multistage, stratified by area, random sample. The study employed a drop-and-collect pen and paper survey. Interviewers made 3 attempts to contact selected households and 3 attempts to personally collect the completed questionnaire. If collection was not possible, a reply-paid addressed envelope was provided. The respondent was selected from members in the household aged 12 years or over on the basis of being the one with the next birthday, and participation was voluntary. For adults aged years 18 and over (relevant to this analysis), a completed interview was classified

as implied consent. The fieldwork was conducted from 31 July to 1 December 2013. Overall, contact was made with 48,579 households, and 23,855 questionnaires were classified as useable (13,945 refused; 1,063 did not speak English; 341 were incapacitated; 9,117 did not return the questionnaire or it was un-useable; and a further 258 were coded as other/non-response), yielding a response rate of 49.1% (Australian Institute of Health and Welfare, 2014).

Data were weighted by geographical stratification, household size, age and sex based on the age/sex profile of each stratum using the Australian Bureau of Statistics estimated resident population data for June 2012 (Australian Bureau of Statistics, 2012). The survey methodology were approved by the AIHW Ethics Committee.

Measures

Respondents who reported that they were a parent/guardian of at least one dependent child were defined as a 'parent' for the purposes of this paper. Parents who had a dependent child in the household were asked 'of all the dependent children, how many are in each of these age categories? '0-2 years old', '3-5 years old', '6-8 years old', '9-11 years old', '12-14 years old', '15 years and over'. Responses were grouped into a variable 'youngest child' using these categories (collapsing 6-8 and 9-11 years old into a primary school category).

Demographic information was collected including respondent's age, gender, and marital status (categorical variable coded into never married, divorced, and married/defacto). Highest educational attainment was coded into completed primary/high school, certificate/diploma,

bachelor degree and postgraduate degree. Employment status was coded into currently employed, unemployed/unable to work and other (student, home duties, retired). Three categories were used for the household income, $1,600 per week or more, $1,000-$1,599 per week and $999 per week or less. Postcode data were merged with the 2011 Socio-economic Index for Areas, Index of disadvantage to allow analysis by ecological measures of level of disadvantage (Pink, 2011).

Respondent's alcohol consumption was assessed using a graduated quantity-frequency measure. In the analyses that follow, alcohol consumption is categorised in terms of the 2009 Australian Guidelines to Reduce Health Risks from Drinking Alcohol (National Health and Medical Research Council, 2009a). The guideline for reducing alcohol-related harm over a lifetime is 'For healthy men and women drinking no more than two standard drinks on any day' (i.e. averaging no more than two standard drinks per day). The guideline for reducing the risk of injury on a single occasion of drinking is 'For healthy men and women, drinking no more than four standard drinks on a single occasion'. The Australian standard drink contains 10g of alcohol (National Health and Medical Research Council, 2009a). For the purposes of this paper, respondents were scored as exceeding this guideline on two alternative variables: if they exceeded the guidelines for single occasion risk at least monthly, and if they did it at least weekly. Respondents were also asked 'Where do you usually drink alcohol?' and were asked to mark all that apply from a range of response options (Table 3).

Statistical analysis

In order to take into account the clustered sampling design of the NDSHS, analyses were conducted using StataIC 13.1 (Stat Corp, 2013). SVYSET and SVY commands were used;

these estimate test statistics while taking into consideration survey design effects, stratification, weighting and the primary sampling unit. All percentages, chi-square-tests, effect sizes and confidence intervals were population weighted estimates accounting for the clustered survey design. All data were tested for sampling variability and the relative standard errors were all less than 25%. They were therefore considered sufficiently reliable for most purposes by the AIHW (Australian Institute of Health and Welfare, 2014).

Drinking rates differ substantially by age, and the vast majority of parents in the current sample fell into the 25-55 year age category (84.1%). We therefore excluded those aged 12-24 years (n=2,900) and 56 years and over (n=9,068), leaving 11,886 respondents aged 25 – 55 years, of whom 11,591 provided their parental and drinking status (64.7% parents). This allowed for comparisons by parental status without biasing the non-parent sample with the drinking rates of older adults. It also allowed for age-matched comparison of adults with and without children. Logistic regression analyses were undertaken for males (Table 1) and females (Table 2) with the consumption variables 1) exceeding guidelines for increased lifetime risk on average per day, 2) exceeding the guidelines for short-term risk at least monthly; and 3) exceeding the guidelines for short-term risk at least weekly. Model 1 controlled for parental age and Model 2 controlled for parental age, marital and employment status because univariate analysis indicated significant differences on these depending on parental status.

RESULTS

Sample characteristics

Demographic characteristics of parents and non-parents indicated that there were significantly more females in the parent group than the non-parent group (53.6% vs 45.7%; χ^2 (df= 1, N = 11,591) =50.3, p < .001). Overall, parents were also more likely to be married or in a de-facto relationship (87.3% vs 55.0%; χ^2 (df= 1, N = 11,591) =712.82, p < .001) and less likely to be currently employed (76.2% vs 79.6%; χ^2 (df= 1, N = 11,591) =16.62, p < .001). Rates of disadvantage, education and household income were equivalent.

Parent versus non-parent alcohol consumption

It was hypothesised that parents would be less likely to exceed Australian alcohol guideline thresholds than adults without children. Results confirm this hypothesis: fewer Australian parents aged 25-55 years drank in excess of the NHMRC guidelines for *lifetime risk* of alcohol-related disease and injury (18.2%, 95% CI=17.0-19.4) compared with non-parents (24.2%, 95% CI=22.6-25.8) (χ^2 (df= 2, N = 11,219) =18.83, p < .001). A lower proportion of parents exceeded the guidelines for *single-occasion risk* on an at least *weekly basis* (14.2%, 95% CI=13.2-15.3) compared with non-parents (21.2%, 95% CI=19.6-22.8) (χ^2 (df= 2, N = 11,219) =28.03, p < .001). Furthermore, a lower proportion of parents exceeded the guidelines for *single-occasion risky* drinking at *least monthly* (27.5%, 95% CI=26.2-28.9) versus non-parents (35.9%, 95% CI=34.0-37.8) (χ^2 (df= 2, N = 11,219) =27.22, p < .001).

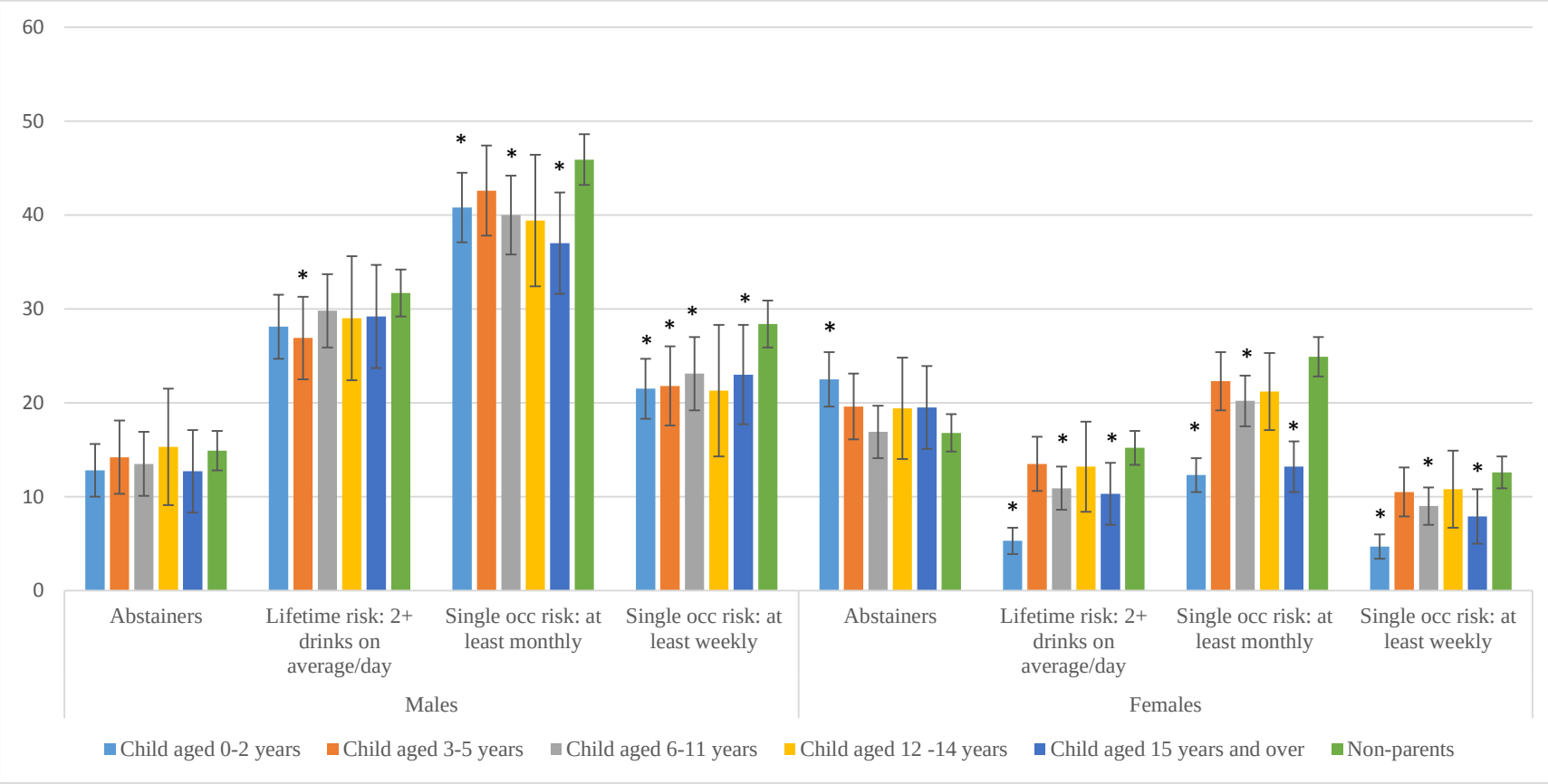
The hypothesis that more fathers would exceed the Australian alcohol guideline thresholds than mothers was confirmed, with fathers significantly[13] more likely to exceed all guidelines. Specifically, fathers exceeded mothers for *increased lifetime risk* (28.3%; 95% CI 26.4-30.3

[13] lifetime risk: (χ^2 (df= 5, N = 7,025) =153.93, p < .0001); single occasion, monthly: (χ^2 (df= 2, N = 7,025) =169.96, p < .0001); single occasion, weekly: (χ^2 (df= 2, N = 7,025) =114.13, p < .0001).

vs 9.6%; 95% CI=8.7-10.7); *the single occasion risk* of alcohol-related injury guideline on an *at least weekly basis* (22.1%; 95% CI=20.3-24.0 vs 7.8; 95% CI=7.0-8.8); and *the single occasion risk* of alcohol-related injury guideline on an at least *monthly basis* (40.0; 95% CI=37.8-42.3 vs 16.9%; 95% CI=15.7-18.2).

The hypothesis that mothers with children aged 2 years and under would be more likely to abstain than mothers of older children was supported. Figure 1 shows the proportion of non-drinkers and drinkers at different levels, by the age of youngest child in the household and the gender of respondent. There were no significant differences in abstention rates for men by parental status. Among women there was a significantly higher abstention rate for those that had a child in the household aged 2 years and under, than all other groups.

At the univariate level, the relationship between fathers' consumption and age of the youngest child (see Figure 1) had no clear pattern. However, mothers were less likely than non-mothers to exceed the guideline for *increased lifetime-risk* or for *single occasion risk* (either at least monthly or weekly) if their youngest child was an infant (aged 0-2 years); in primary school (6-11 years); or in senior high school or older (15 years and over).



* P<0.05 chi-square between group and non-parents

Figure 1: *Prevalence (%) of alcohol consumption among adults aged 25-55 years by age of youngest child*

Model 1 (summarised in Table 1) showed no impact of father status on prevalence of consumption at rates associated with *increased lifetime risk*. This effect remained after controlling for the fathers' age, employment and marital status in Model 2. By contrast, after controlling for the fathers' age (Model 1), fathers with a youngest child aged 0-2 years were less likely to exceed the guidelines for increased short-term risk on an *at least monthly basis* than non-fathers. This effect was also found in Model 2 after controlling for fathers' age, employment and marital status. Model 1 indicated that fathers with a child aged 5 years or younger were less likely to exceed the guidelines for increased *short-term risk on an at least weekly basis* than non-fathers, when controlling for fathers' age. This effect remained but only for fathers with the youngest child aged 0-2 years when controlling for fathers' age, employment and marital status in Model 2.

Table 2 shows that, among women, results were very similar across both models. Overall, mothers were less likely to exceed the guideline for *increased lifetime risk* if their youngest child was an infant (0-2 years); in primary school (6-11 years) and in high school or above (15 years and over) compared with women without children. After controlling for mothers' age, mothers were also less likely to exceed the guideline for *short-term risk at least weekly and monthly* with the same age-categories of youngest child as above (i.e. 0-2 years, 6-11 years and 15 years and over). However, the effect for mothers of children in primary school (6-11 years) was diminished after controlling for mothers' age, marital and employment status.

Table 1. *Logistic regression analysis: exceeding guidelines among <u>males</u> aged 25-55 by age of youngest child in the house*

	Model 1 OR n=4847	95% CI	Model 2 OR n=4638	95% CI
1. Exceeding the guidelines for lifetime risk of disease or injury				
Age of youngest child (no child as ref category)				
Child aged 0-2 years	0.84	0.68-1.02	0.85	0.67-1.06
Child aged 3-5 years	0.80	0.63-1.02	0.86	0.66-1.11
Child aged 6-11 years	0.94	0.77-1.16	0.96	0.77-1.20
Child aged 12-14 years	0.92	0.66-1.28	0.93	0.66-1.32
Child aged 15 years and over	0.94	0.71-1.24	0.99	0.74-1.31
Age (continuous variable)	1.00	0.99-1.00	0.99	0.98-1.00
Employment status (employed as ref category)				
Unemployed			1.01	0.71-1.43
Other			**0.51*****	0.37-0.69
Marital status (never married as ref category)				
Divorced			**1.41***	1.04-1.91
Married/defacto			0.87	0.70-1.09
2. Exceeding the guidelines for short-term risk on a <u>monthly basis</u>				
Age of youngest child (no child as ref category)				
Child aged 0-2 years	**0.78***	0.65-0.94	**0.77***	0.62-0.94
Child aged 3-5 years	0.89	0.70-1.12	0.90	0.70 -1.16
Child aged 6-11 years	0.87	0.71-1.08	0.85	0.68-1.07
Child aged 12-14 years	0.91	0.66-1.26	0.90	0.64-1.25
Child aged 15 years and over	0.83	0.64-1.09	0.82	0.63-1.07
Age (continuous variable)	**0.98*****	0.97-0.99	**0.98*****	0.97-0.99
Employment status (employed as ref category)				
Unemployed			0.76	0.55-1.04
Other			**0.45*****	0.34-0.59
Marital status (never married as ref category)				
Divorced			1.19	0.88-1.62
Married/defacto			0.84	0.68-1.04
3. Exceeding the guidelines for short-term risk on a <u>weekly basis</u>				
Age of youngest child (no child as ref category)				
Child aged 0-2 years	**0.67*****	0.54-0.84	**0.71****	0.56-0.92
Child aged 3-5 years	**0.71***	0.55-0.92	0.79	0.60-1.04
Child aged 6-11 years	0.82	0.65-1.04	0.85	0.66-1.10
Child aged 12-14 years	0.77	0.51-1.16	0.82	0.54-1.25
Child aged 15 years and over	0.86	0.63-1.17	0.92	0.67-1.25
Age (continuous variable)	**0.99****	0.98-0.99	**0.99***	0.98-1.00
Employment status (employed as ref category)				
Unemployed			0.92	0.65-1.32
Other			**0.51*****	0.37-0.71
Marital status (never married as ref category)				
Divorced			1.36	0.98-1.88
Married/defacto			**0.79***	0.63-0.99

***p≤0.001, **p≤0.01, *p<0.05

All models were a good fit based on the method by Archer et al. (2007)

Table 2. *Logistic regression analysis: exceeding guidelines among females aged 25-55 by age of youngest child in the house*

	Model 1 OR n=6744	95% CI	Model 2[#] OR n=6414	95% CI
1. Exceeding the guidelines for lifetime risk of disease or injury				
Age of youngest child (no child as ref category)				
Child aged 0-2 years	**0.32*** **	0.24-0.43	**0.37*** **	0.27-0.51
Child aged 3-5 years	0.89	0.68-1.16	1.03	0.78-1.36
Child aged 6-11 years	**0.68** **	0.53-0.88	**0.72***	0.55-0.94
Child aged 12-14 years	0.84	0.56-1.26	0.83	0.56-1.25
Child aged 15 years and over	**0.62** **	0.45-0.87	**0.62** **	0.44-0.87
Age (continuous variable)	1.00	0.99-1.01	1.01	0.99-1.02
Employment status (employed as ref category)				
Unemployed			0.75	0.51-1.09
Other			0.92	0.74-1.13
Marital status (never married as ref category)				
Divorced			0.99	0.71-1.38
Married/defacto			**0.69** **	0.54-0.88
2. Exceeding the guidelines for short-term risk on a monthly basis				
Age of youngest child (no child as ref category)				
Child aged 0-2 years	**0.37*** **	0.29-0.46	**0.50*** **	0.39-0.65
Child aged 3-5 years	0.83	0.66-1.03	1.08	0.85-1.37
Child aged 6-11 years	**0.81***	0.66-1.00	0.96	0.78-1.20
Child aged 12-14 years	0.97	0.72-1.29	1.11	0.82-1.50
Child aged 15 years and over	**0.60*** **	0.45-0.79	**0.60*** **	0.44-0.81
Age (continuous variable)	**0.97*** **	0.96-0.98	**0.98*** **	0.97-0.99
Employment status (employed as ref category)				
Unemployed			**0.55*** **	0.39-0.76
Other			**0.78** **	0.67-0.92
Marital status (never married as ref category)				
Divorced			0.88	0.67-1.15
Married/defacto			**0.51*** **	0.43-0.62
3. Exceeding the guidelines for short-term risk on a weekly basis				
Age of youngest child (no child as ref category)				
Child aged 0-2 years	**0.32*** **	0.23-0.44	**0.41*** **	0.29-0.58
Child aged 3-5 years	0.78	0.58-1.05	0.99	0.72-1.36
Child aged 6-11 years	**0.69** **	0.53-0.90	0.77	0.58-1.03
Child aged 12-14 years	0.88	0.58-1.32	1.06	0.70-1.62
Child aged 15 years and over	**0.63***	0.44-0.92	**0.63***	0.42-0.94
Age (continuous variable)	0.99	0.98-1.00	1.00	0.98-1.01
Employment status (employed as ref category)				
Unemployed			0.81	0.53-1.22
Other			0.96	0.77-1.21
Marital status (never married as ref category)				
Divorced			0.80	0.56-1.13
Married/defacto			**0.50*** **	0.39-0.65

***p≤0.001, **p≤0.01, *p<0.05

All models were a good fit based on the method by Archer et al. (2007)

Where do parents usually drink alcohol?

The final hypothesis tested the impact of parenthood on location of consumption and the moderating impact of child age. Results confirmed that overall, parents were significantly more likely to drink in their home (84.6% vs 79.6%; χ^2 (df= 1, N = 9,393) =29.8, p < .0001) and significantly less likely to drink at a friends' house (38.5% vs 43.0%; χ^2 (df= 1, N = 9,393) =14.32, p < .001), at a party at a friends' house (31.2% vs 35.7%; χ^2 (df= 1, N = 9,393) =15.12, p < .001), at restaurants/cafés (39.0% vs 45.6%; χ^2 (df= 1, N = 9,393) =28.07, p < .0001) and at licenced premises (34.4% vs 48.2%; χ^2 (df= 1, N = 9,393) =134.41, p < .0001) than adults without children. Table 3 confirms the pattern about drinking in the home, with fathers of children aged 0-2 years or 6-14 years being significantly more likely to drink in the home than non-fathers.

The pattern was less clear among women, there were no significant differences found between mothers and those without children for drinking in the home or drinking a friend's house. However, significantly fewer mothers reported drinking at restaurants and cafes or at licenced premises than women without children. There were no significant differences in place of consumption by age of the youngest child in the home among mothers.

Table 3. *Place of consumption among adults aged 25-55 years by gender of the parent/adult and age of youngest child among parents*

Response categories	Child aged 0-2 years (95% CI)	Child aged 3-5 years (95% CI)	Child aged 6-11 years (95% CI)	Child aged 12 – 14 years (95% CI)	Child aged 15+ years (95% CI)	No dependent children (95% CI)	Summary chi-square significance
Males							
Where do you usually drink alcohol?#							
In my own/spouse's/ partner's home	87.8 (85.0-90.2)	81.7 (76.6-85.8)	86.3 (82.8-89.1)	90.3 (85.0-93.8)	84.1 (79.1-88.1)	79.3 (77.0-81.4)	P<0.001
At a friend's house	39.8 (36.0-43.8)	37.7 (31.4-40.5)	35.8 (31.4-40.5)	33.7 (26.6-41.6)	33.8 (28.3-39.7)	42.9 (40.2-45.6)	P<0.05
A party at someone's house	28.2 (24.9-31.7)	26.7 (22.3-31.6)	30.7 (26.6-35.2)	30.9 (24.0-38.7)	26.2 (21.2-31.8)	35.2 (32.5-38.0)	P<0.01
At restaurants/cafes	35.8 (32.2-39.7)	29.0 (24.3-34.1)	36.0 (31.6-40.7)	37.8 (30.7-45.6)	35.1 (29.3-41.3)	40.1 (37.3-42.9)	P<0.05
At licenced premises (e.g. pubs, clubs)	38.9 (35.2-42.8)	34.9 (29.8-40.4)	33.4 (29.0-38.0)	38.8 (31.4-46.7)	34.3 (28.6-40.5)	50.3 (47.5-53.1)	P<0.001
Females							
Where do you usually drink alcohol?#							
In my own/spouse's/ partner's home	83.4 (80.9-85.7)	83.3 (80.0-86.2)	82.0 (79.0-84.6)	85.1 (80.0-89.0)	83.4 (78.8-87.1)	79.9 (77.7-81.9)	NS
At a friend's house	40.6 (37.5-43.8)	39.2 (35.2-43.3)	42.8 (35.2-43.3)	38.3 (32.3-44.6)	36.1 (31.1-41.4)	43.2 (40.7-45.8)	NS
A party at someone's house	32.2 (29.1-35.4)	32.2 (28.4-36.2)	34.7 (31.2-38.2)	37.9 (31.9-44.3)	35.5 (30.5-40.9)	36.4 (34.0-38.8)	NS
At restaurants/cafes	43.5 (40.3-46.9)	39.3 (35.2-43.6)	45.0 (41.2-48.9)	42.8 (36.5-49.5)	43.7 (38.6-49.1)	52.3 (49.7-54.8)	P<0.001
At licenced premises (e.g. pubs, clubs)	33.0 (29.9-36.3)	34.3 (30.4-38.4)	32.4 (29.2-35.8)	32.6 (26.7-39.0)	30.0 (25.3-35.3)	45.8 (43.2-48.3)	P<0.001

#Response categories not mutually exclusive (mark all that apply). CI, confidence interval; NS, not significant.

Consistent with our first hypothesis and previous Australian studies, the results confirm that parents are less likely to exceed health guidelines for alcohol consumption than non-parents (Laslett et al., 2017; Maloney et al., 2010). Most importantly, the results highlight how age of the child moderates this result, particularly among mothers.

Also as hypothesised, results indicated that fathers are far more likely to exceed the guideline thresholds than mothers. Overall, abstention rates did not differ among men by parental status or for fathers according to age of child in the home, nor did the proportion of fathers and non-fathers that drank in excess of the guidelines for lifetime risk on an average daily basis. This contrasted with results for mothers, who were more likely to abstain when their child was an infant (aged 0-2 years). A possible factor contributing to this is the widely promulgated Australian recommendation that women who are pregnant and breastfeeding should avoid alcohol (Callinan, 2012).

Men were less likely to exceed the guideline for short-term risk either weekly or monthly if they had infants in the household. One possible explanation that warrants further investigation is that fathers may have less opportunity to drink away from home when the children are young. Future research should test motivations for drinking in different environments.

Among women, an interesting pattern emerged in examination of those exceeding the guidelines for lifetime risk and short-term risk (monthly and weekly). Mothers were significantly less likely than other women to exceed the guideline for increased risk when their youngest child in the household was an infant (i.e. aged 0-2); in primary school (6-11 years) or in senior high school or beyond (15 years and over). They were also less likely to exceed the guideline for increased short-term risk at least monthly or weekly if their child was an infant or in senior high school or beyond. Although the reasons why these ages are

associated with more controlled intake remain to be established, perceived role-related responsibilities should be examined. These may include primary parenting responsibility and the challenge of return to work.

A study drawing on Classical Role Theory, posits that the greater the number of roles a person has, the more an individual's life is structured by meaningful activities, and the less likely they will engage in higher volume drinking (Kuntsche, Knibbe, & Gmel, 2009). It was particularly interesting to note that mothers were less likely to exceed the guidelines, independent of sociodemographic factors, when their youngest dependent child was 15 years or over. The reasons behind this finding require further research including exploring how mothers' perceived responsibilities vary according to the ages of their children and how these perceived responsibilities impact behaviour. This may include potential roles in transporting their adolescents to social engagements and parties and the fact they may see themselves as role models for children entering an age at which they will be increasingly exposed to peer consumption.

Although parents were less likely to exceed alcohol guidelines than non-parents, it is important to highlight that there are still a high number of Australian children with parents who consume alcohol in excess on a regular basis. Results indicated that approximately one in four Australian fathers and one in ten mothers are drinking more than two standard drinks on average per day. Furthermore, one in five fathers are drinking more than four standard drinks on any one occasion at least once per week. This has implications for general parenting, role-modelling and rule setting around alcohol. It is recommended that the drinking of fathers be further examined, particularly within the home, and possible maternal compensation for paternal consumption be tested.

We also found, as predicted, that parents were more likely to drink alcohol within the home setting than non-parents. On one hand, this is a positive finding, as US evidence shows that drinking at home in comparison to bars is less likely to be associated with heavy drinking and also less likely to be associated with physical abuse of children (Freisthler & Gruenewald, 2013). On the other hand, this drinking is potentially more likely to occur in front of children, thereby providing negative role modelling and impacting childrens' alcohol expectancies, initiation and consumption patterns in childhood and adolescence.

The hypothesis that parents would be more likely to consume alcohol in the home if their child was younger, was confirmed among fathers, but not among mothers. Consistent with the finding by Paradis, (2011) (Paradis, 2011), we found that parents were less likely to drink in other contexts such as restaurants and licenced premises, where heavier consumption is more likely. The results of this study lend some support to the contention that parenting "protects" people from exposure to contexts that encourage consumption.

Although parents were more likely to consume alcohol within the home, it is not clear whether this consumption occurred in front of children. This is important because, as argued by Voogt et al, (2017) (Voogt et al., 2017), some parents may drink frequently, but not when their children are present, and others may drink less frequently but may predominantly do so in front of their children. This suggests that childrens' exposure to parental alcohol use rather than parental alcohol use per se, may be more important to role modelling. A recent systematic review has confirmed that alcohol expectancies predict alcohol use initiation and drinking patterns over time in children and adolescents (Smit et al., 2018). Further research is important to determine whether parents are aware of their impact as a role model on their child's drinking behaviour and alcohol-related cognitions (i.e. knowledge, norms and expectancies) that have been shown to influence initiation and consumption patterns (Smit et al., 2018; Yap et al., 2017).

This study, whilst one of the largest in Australia, has some limitations. First, this study investigated the impact on parents' consumption of children and the moderating impact of child age. Although parent gender was important, data did not allow testing for the impact of child gender. Second, analyses were focussed on the youngest child and did not take into account age or number of the other children in the household. Third, it is possible that parents may be differentially subject to social desirability bias in responding to these questions. Fourth, this study did not examine the impact of single parenting on consumption and lastly, the response rate of 49%, although similar to previous surveys (Australian Institute of Health and Welfare, 2018), means that data may not be generalisable.

Despite these limitations, the findings have important implications for public health. Parents are less likely to exceed recommended alcohol consumption guidelines, but there is still a significant minority, particularly fathers, who are drinking at levels that warrant further attention. A focus on adult drinking is important in public health efforts to reduce population drinking rates, and an important element of this, is attention to levels of consumption in adults in the age groups where parents with children at home are in the majority.

CHAPTER 5: PAPER FOUR

5.1 Preamble

The results presented in Chapter 4 highlighted that fewer parents (18.2%) than non-parents (24.2%) drank in excess of the guidelines for increased lifetime risk of alcohol-related disease and injury. In addition, fewer parents (14.2%) than non-parents (21.2%) drank more than 4 drinks on a single occasion on a weekly basis; a consumption level linked to increased injury.

The study also found that fathers were more likely to exceed guidelines than mothers, and that age of the child was associated with different rates of consumption among mothers. Specifically, mothers, where the youngest children aged 0 to 2 years, 6 to 11 years or 15 years and over were less likely to exceed the guidelines for increased long-term risk than non-mothers. Mothers who had a youngest child aged 0 to 2 years or 15 years and over were less likely to exceed the guidelines for increased short-term increased risk than non-mothers. Despite the fact that fewer parents exceeded guidelines, there is still a substantial proportion of parents, particularly fathers, who regularly exceed guidelines focused on long-term and short-term consumption limits.

Australian studies have not directly investigated whether this consumption occurs in front of children or at other times. This is despite the fact that the Australian Parenting Guidelines recommend that parents limit their alcohol use, particularly around children, and that parents should not get drunk, especially in front of their children (Siobhan, Anthony, & Dan, 2010).

The above results formed the basis for the study described in the following chapter. Furthermore, as described in Chapter 1, few studies around the world have investigated social norms about the acceptability of drinking alcohol in front of children. Two studies of

particular note that have addressed this issue internationally include one in Finland (Raitasalo et al., 2011) and another in Norway (Scheffels et al., 2016). These studies investigated the role of injunctive norms or attitudes to parental alcohol consumption and found that drinking in moderation was accepted but drinking to the point of drunkenness was not. In addition, the study in Finland investigated levels of drinking in front of children and identified a discrepancy between norms and behaviour which will be tested for generalisability in an Australian sample. An online survey methodology was chosen for this purpose to allow oversampling of parents in a cost-effective manner.

Levels of parental drinking in the presence of children: an exploration of attitudinal and contextual correlates

Submitted for publication to International Journal of Drug Policy on 28 June, 2018, reviewers' feedback has been received and is due to the journal by April 2019.

5.2 Statement of authorship

Principal author

Name of Principal Author (Candidate)	Jacqueline Bowden		
Contribution to the Paper	I was responsible for primary authorship of this paper, and led its conceptualisation and design in collaboration with co-authors. I conducted the statistical analyses, and took the lead role in interpreting the results and writing and revising the manuscript. I served as corresponding author and was responsible for manuscript submission. I will also be responsible for revisions, and responses to journal reviews where needed.		
Overall percentage (%)	80		
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
Signature		Date	24 August 2018

Co-author contributions

By signing the Statement of Authorship, each author certifies that:

i. the candidate's stated contribution to the publication is accurate (as detailed above);
ii. permission is granted for the candidate in include the publication in the thesis; and
iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Professor Carlene Wilson
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I will also provide advice on responding to comments by the journal reviewers and editor.

Signature		Date	25 August 2018

Name of Co-Author	Professor Robin Room		
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I will also provide advice on responding to comments by the journal reviewers and editor.		
Signature		Date	25 August 2018

Name of Co-Author	Professor Paul Delfabbro		
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I will also provide advice on responding to comments by the journal reviewers and editor.		
Signature		Date	25 August 2018

Name of Co-Author	A/Professor Caroline Miller		
Contribution to the Paper	I commented on drafts, made suggestions on the methodology and presentation of material in the paper, and provided editorial input. I will also provide advice on responding to comments by the journal reviewers and editor.		
Signature		Date	25 August 2018

5.3 Paper four

ABSTRACT

Background/introduction: Parental consumption of alcohol in the presence of children can influence the latter's drinking habits as they age. Excessive alcohol consumption can also negatively affect parenting. Few studies have examined perceived norms and parental alcohol use in front of children, and how these vary based on the age of the child and gender of the parent.

Methods: A cross-sectional online survey was undertaken with n=1,000 Australian adults (including n=670 parents) aged 18-59 years recruited though an online panel. The survey assessed: alcohol consumption in front of children; normative attitudes towards drinking and getting drunk in the presence of children; perceived parental norms; and place of consumption.

Results: Parents with children five years or under were less supportive of drinking in the presence of small children than parents with older children, with women expressing the strongest opposition. Respondents were less concerned about a father drinking one or two drinks in front of their children than a mother. Respondents with stricter views about drinking in the presence of children were less likely to do so. Overall: 37.3% of parents reported drinking a glass of alcohol each day or a couple of times a week; 20.1% reported that they get slightly drunk; and 8.6% indicated getting "visibly drunk" each day or a couple of times a week with their children present. Fathers were more likely to drink, and drink more regularly in front of children than mothers.

Conclusion: Moderate parental drinking in front of children was accepted but drunkenness was not. While parents may be conscious of their influence as role models, this is not a large factor in determining their decision to drink or not in front of their children.

This study highlights the need to change parental attitudes as a precursor to changing behaviour.

INTRODUCTION

Alcohol consumption is widely accepted in Australian society with the World Health Organization ranking Australia in the top 20 countries on consumption per capita for those aged 15 and older. The level of 12.2 litres of alcohol consumed per year by Australians is comparable to Croatia and France and higher than the average of 6.2 litres per year worldwide (World Health Organization, 2018a).

Despite this consumption level, public drunkenness is generally viewed as unacceptable and sometimes, a criminal offence. Strong laws exist in all Australian states and territories that make drinking more than a small amount (i.e. up to a blood alcohol content level of 0.05) and driving a vehicle an offence. Occupational health and safety regulations also constrain consumption in many workplaces (Room, 2011). As a consequence of the laws and regulations that prohibit alcohol consumption in a number of environmental contexts, and of the much higher price per drink in pubs, clubs or restaurants than for off-premise alcohol, consumption often occurs within the home (Australian Institute of Health and Welfare, 2017). Moreover, given that approximately 50% of Australians aged 18 – 59 years are parents of dependent children (aged 0-14, or older children who are still financially dependent), suggests this consumption may occur in an environment where children are present. For example Bowden at al. (2018) recently analysed a population survey of consumption levels and reported that although parents were less likely to exceed government alcohol recommendations set by the National Health and Medical Research Council (NHMRC) (National Health and Medical Research Council, 2009a) than non-parents, 18.2% drank more than 2 drinks on average per day, putting themselves at risk of chronic disease, and 14.2% were drinking more than 4 drinks on a single occasion on a weekly basis, putting themselves at risk of injury. The study also found that fathers were more likely to exceed guidelines overall than mothers, and age of the child was related to drinking rates among mothers

(Bowden, Delfabbro, Room, Miller, & Wilson, 2018). Studies have not directly investigated whether this parental consumption in Australia occurs in front of children or otherwise.

There is compelling evidence from a recent meta-analysis of longitudinal studies that parental consumption behaviour and attitudes influence adolescent drinking, notwithstanding a small effect size (Yap et al., 2017). It is not the only predictor of adolescent drinking, with significant predictors including peer behaviour and attitudes, advertising, price and availability, but it is an important predictor that can potentially be modified.

There are a range of ways children can be affected directly and indirectly by parents' or caregivers' drinking in their presence, with two main mechanisms being role modelling, which has been well documented to be linked to earlier initiation of alcohol (Getz & Bray, 2005; Hawkins et al., 1997; Peterson et al., 1994; Ryan et al., 2010) and future drinking habits (Ryan et al., 2010), and poor supervision of children, potentially resulting in injury (Crandall et al., 2006) or ongoing maltreatment in serious circumstances (Laslett et al., 2012). While there are quite compelling data directly linking parental consumption to acute, proximal negative outcomes, such as accidents and violence in the home, the association with more distal outcomes associated with establishing normative beliefs about consumption remains less well documented and understood.

While there is clear evidence to support the link between parental consumption and adolescent consumption, Homel and Warren (2017) highlighted that studies have not reported results in a way that allows a clear understanding of the influence of actual levels of consumption (i.e. number of drinks per week) that might be "safe" in terms of limiting its influence on adolescent consumption. Currently the evidence is mixed; for example, one study in the UK found mothers drinking at light or heavy levels increased the odds of children drinking (OR 1.6 and 1.8 respectively) compared with mothers who abstained (Kelly et al., 2016). In contrast, adolescents in the Netherlands were influenced if the parents drank

heavily at least once a week, but were not if the parents drank less (Vermeulen-Smit et al., 2012). Another Dutch study found a linear relationship between parental and adolescent consumption (Spijkerman et al., 2007).

Evidence does not currently exist for Australian adolescents. One Australian study that examined the issue concluded that 'parental drinking (*especially if it is frequent and heavy*) does increase likelihood of early adolescent drinking' implying the potential existence of a "safe" level of consumption among children (Homel & Warren, 2017, page 82, emphasis added). Currently, Australian parenting guidelines, developed based on a systematic review and the opinions of a panel of experts, recommend that parents *limit* their alcohol use, particularly around children and that *parents should not get drunk*, especially in front of their children (Ryan et al., 2011). In light of these guidelines, this study will focus on attitudes of parents to drinking in the presence of children at a moderate level, versus at levels linked to drunkenness.

Despite the lack of evidence on the amount of parental consumption that is appropriate, evidence links parental role modelling with adolescent consumption and, as described previously, there are a large proportion of parents exceeding health guidelines. Notwithstanding this, few studies have documented perceptions of normal, acceptable parental alcohol consumption in front of children, either in terms of what parents think others currently do (i.e. descriptive norms) or in terms of what they think social expectations are ((i.e. injunctive norms as described by Cialdini et al. (1991)). Descriptive norms have been empirically demonstrated as influencing adolescent and young adult consumption (Haug et al., 2011; Kypri & Langley, 2003; Neighbors et al., 2007), although findings with parents are less commonplace. There has been little work in Australia describing either descriptive or injunctive norms for parental drinking.

A Finnish study did identify an injunctive norm, endorsed by 72% of the sample, which indicated that drinking in the presence of *small* children was unacceptable (Raitasalo et al., 2011). Additionally, 95% of the same sample indicated that being drunk in the presence of *small* children was also unacceptable. Moderating influences on these injunctive norms were also tested. Results indicated that gender moderated the impact so that women were generally stricter in their views than men, but that there were no differences in opinion by age of youngest child in the home.

The complexity of these attitudes and their influence is important to note; Raitasalo et al., (2011) reported that parental attitudes were largely independent of actual drinking behaviour, and those with more negative attitude to consumption reported drinking in the presence of children, nonetheless. Similarly, Scheffels et al., (2016) reported Norwegian data on attitude to mothers and fathers drinking in the presence of children, and confirmed that the acceptability of drinking in front of children decreased as the amount consumed increased. There was no difference in attitudes by gender of the parent drinking in front of the child.

A third study indicated some differences in these attitudes between countries (Fjær et al., 2016). Comparison of the acceptability of visible intoxication in the UK, where per capita consumption is slightly less than Australia, and Norway, found that it was less acceptable to be visibly intoxicated in Norway than the UK when children were present. Like the findings of Raitasalo et al (2011), results also indicated that women rated visible intoxication as less acceptable than men.

In this study, we investigate Australian parents' perception of norms and their association with drinking in front of children, building on the previous three studies conducted elsewhere (Fjær et al., 2016; Raitasalo et al., 2011; Scheffels et al., 2016) as a basis. The study also builds on the Australian study that indicated that there were differences

in parental consumption by age of the youngest child (Bowden et al., 2018). The following hypotheses were tested:

Normative attitudes

Hypothesis 1: *Adults' attitude to parental consumption of alcohol in front of children will vary depending upon whether the parent asked about is a mother or father, with more negative attitudes to maternal consumption.*

Hypothesis 2: *Age of own child will impact parental injunctive and descriptive norms for alcohol consumption in the presence of young children, with parents of younger children indicating more negative norms than parents of older children.*

Consumption around children

Hypothesis 3: *Age of child in the home and status as mother or father will impact drinking in front of children and at home, with least consumption in mothers of young children.*

In addition to these hypotheses, the study aimed to explore parental motivations to reduce alcohol consumption in the short-term, and how these varied according to gender of the parent and location.

METHODS

Design and setting

Data were collected from a sample of Australian adults aged 18-59 years. Fieldwork was undertaken from 12-18 October 2017. Ethics approval was obtained from The University of Adelaide Human Research Ethics Committee, application no. 17/77.

Participants

The sample comprised 1,000 18-59 year olds[14]. Recruitment was conducted through an online panel, including participants from around Australia who have supplied demographic information (e.g. age, gender, location). The online panel is accredited under the International Organization for Standardization's (ISO) standards for access panels in market, opinion and social research (AS ISO 26362).

Procedure

Survey panel members were invited to participate via email, with a web link to the survey. Participants were offered points towards rewards for completion of the survey from the panel supplier (equivalent to less than $5 to be redeemed for gift cards, points programs, charitable contributions, and partner products or services). Potential participants first completed questions assessing qualifying criteria and quotas (to achieve at least 50% parents, responses across each Australian jurisdiction and approximately even numbers of men and women). The survey took approximately 20 minutes to complete.

Measures

Demographic questions captured gender, age, parental status and age of the youngest child in the home.[15]

[14] 18-59 year olds were chosen to be consistent with Raitasalo et al, 2011.
[15] Youngest child was used to enable comparisons between this study and the study by Raitasalo et al, (2011), however for the purposes of this study we used three categories in some instances (0-5 years, 6-12 years and 13-17 years) whereas they used two.

Measures of alcohol consumption

Self-reported alcohol consumption behaviour in front of children: To assess parental alcohol consumption in front of their children, parents who reported that they had children under 18 years of age and who had drunk in the past year were asked to self-report their own consumption at each of three different consumption levels (i.e. drinks a glass of wine; gets slightly intoxicated; gets clearly intoxicated) at three different frequency levels (a couple of times per year; a couple of times per month; a couple of times per week). See Table 3.

Recollections of drinking and restricting drinking in different contexts: To assess locations of parental alcohol consumption in front of children and short-term restrictions on drinking, parents were asked '*do you ever drink at home with your children present?*', *'do you ever go to a restaurant for a meal with your children present?'* and *'do you sometimes visit a friend's house for a meal with your children?'* Those that replied yes (to any), were asked '*thinking about the last time this happened, did you drink alcohol?'*; [if yes,] '*did you deliberately restrict your drinking in any way?*'. If yes, they were asked to describe how in a free response; responses were coded as per Table 4.

Measures of Perceived Norms

Injunctive norms for drinking in the presence of children were measured using two tools. The first tool was slightly modified for the Australian context from Scheffels et al., (2016). Respondents were asked to evaluate someone drinking in the presence of their 10-year-old child at each of three different consumption levels (i.e. drinks a glass of wine; gets slightly intoxicated; gets clearly intoxicated), each asked at three different frequency levels

(i.e. a couple of times per year; a couple of times per month; a couple of times per week). See Table 1.

The second tool assessed injunctive norms on the basis of responses to three questions, modified for the Australian context, and taken from Raitasalo et al., (2011): See Table 1 for questions 1, 3 and 4. Another question was added to assess views of moderate consumption (question 2, Table 1). Responses were rated on a 5-point scale from 'totally agree' to 'totally disagree' which was then coded for data analysis purposes to 'agree', 'neutral' and 'disagree'.

Descriptive norms for drinking in the presence of children were assessed by asking people to indicate on a 5 point scale from 'strongly agree' to 'strongly disagree' whether *'most people my age drink alcohol in front of their children occasionally'*, '*most people my age drink alcohol at gatherings where children are present'* and *'most people don't think about the fact that they are role models for children in regard to alcohol consumption'* then coded into 'agree', 'neutral' and 'disagree'.

Analyses

Data were analysed using IBM SPSS Statistics 22. Most analyses used cross tabulations and chi-square, or comparison of confidence intervals. Mean differences in responses to parental alcohol consumption in front of children were compared for mothers and fathers using paired samples t-tests (Pallant, 2013, page 252).

RESULTS

Sample characteristics

The sample consisted of 53.4% females, 670 parents (67%; 61.0% female) and 330 non-parents (33%; 37.9% female) and was largely comparable to the 2013 National Drug

Strategy Household Survey sample (NDSHS) in terms of gender (46.4% male (95% CI=43.3-49.5) vs 49.5% male in NDSHS (95% CI=48.4-50.5)) and geographic location (Australian jurisdiction). There was some under-representation of the younger age groups, possibly due to the quota applied for parents; 11.8% 18-29 year olds (95% CI=9.8-13.8) in this sample vs 25.1% in NDSHS (95% CI=24.0-26.3) (Bowden, 2018).

Views on father's versus mother's drinking in the presence of a child

It was hypothesised that adult's attitude to parental alcohol consumption in front of children will vary depending upon whether the parent is a mother or father. Results summarised in Table 1 confirm this hypothesis, indicating that there was a little less concern with fathers than with mothers drinking a glass of wine in front of the child. Differences in disapproval varied with level so that there was roughly equal concern about both fathers and mothers getting slightly intoxicated or clearly intoxicated in front of children (although there was more concern about a mother getting slightly intoxicated a couple of times a week than a father). Males appeared less concerned across all levels, they were significantly less concerned about men drinking a glass of wine in front of a child, and, although they were not supportive, they were less concerned than females with fathers drinking a couple of times per month or week to the point of visible intoxication. Females were more concerned about a father getting slightly intoxicated a couple of times per week in front of their 10 year old child than a mother. Table 1 also shows that the more frequently parents (either fathers or mothers) were drinking in front of a child, the more concerned respondents were.

Table 1. *Concern* about parents drinking while a 10 year old child is present (injunctive norm) among males, females and adults overall*

	Mean (SD) among <u>all males</u> (n=464)		Mean (SD) among <u>all females</u> (n=534)		Mean (SD) Among <u>all adults</u> (n=1000)[#]	
	Concern about father...	**Concern about mother...**	**Concern about father...**	**Concern about mother...**	**Concern about father...**	**Concern about mother...**
..drinking a glass of wine…						
...a *couple of times per year*	**1.52** * (0.84)	**1.60** * (0.94)	**1.49** * (0.90)	**1.57** * (0.96)	**1.50** * (0.87)	**1.58** * (0.95)
...a *couple of times per month*	**1.66** * (0.94)	**1.76** * (1.03)	**1.67** * (1.00)	**1.72** * (1.04)	**1.67** * (0.97)	**1.74** * (1.04)
...*a couple of times per week*	**1.92** * (1.08)	**2.01** * (1.12)	2.01 (1.10)	2.04 (1.15)	**1.97** * (1.09)	**2.03** * (1.14)
…while his/her 10-year-old child is present						
..getting slightly intoxicated (gets more talkative and lively than he/she usually is)						
...a *couple of times per year*	2.05 (1.02)	2.11 (1.09)	2.22 (1.06)	2.19 (1.12)	2.14 (1.04)	2.15 (1.11)
...a *couple of times per month*	2.27 (1.01)	2.33 (1.05)	2.55 (1.00)	2.53 (1.05)	2.42 (1.01)	2.43 (1.05)
...*a couple of times per week*	2.64 (1.08)	2.63 (1.06)	**2.96** * (1.00)	**2.87** * (1.01)	**2.81** * (1.05)	**2.75** * (1.04)
…while his/her 10-year-old child is present						
...getting clearly intoxicated (speaks unclearly, walks unsteadily)						
...a *couple of times per year*	2.91 (1.05)	2.91 (1.09)	3.10 (0.99)	3.09 (1.00)	3.01 (1.03)	3.00 (1.05)
...a *couple of times per month*	**3.09** * (1.03)	**3.19** * (0.97)	3.37 (0.85)	3.34 (0.86)	3.24 (0.95)	3.27 (0.92)
...*a couple of times per week*	**3.28** * (0.98)	**3.37** * (0.94)	3.55 (0.79)	3.53 (0.79)	3.43 (0.90)	3.45 (0.87)
…while his/her 10-year-old child is present						

*higher mean indicates more concern (1=not at all concerning – 4=very concerning)

[#] 2 respondents indicated that they were gender diverse (the total of 464 males and 534 females is n=998)

Bold with * = significant paired samples t-test at $p<0.05$

Influence of status as parent and child age on injunctive and descriptive norms

Hypothesis two suggested that '*Age of own child will impact parental injunctive and descriptive norms for alcohol consumption in the presence of young children, with parents of younger children indicating more negative norms than parents of older children'*. This was confirmed for injunctive norms but not descriptive norms; parents with a child less than 5 years of age were more likely to agree that alcohol should not be used at all in the presence of small children than parents with a child 6-17 years (χ^2(df=2, n=670) = 11.35, p<0.05) and were less likely to agree that it is okay for a person to have one or two drinks in the presence of small children (χ^2(df=2, n=670) = 9.06, p<0.05). There was no difference for descriptive norms by age of youngest child.

Attitude to consumption varied only marginally between mothers and fathers and according to the age of the youngest child in the home (See Table 2). Specifically, there was a trend for mothers to become more permissive of moderate drinking with increasing age of the youngest child in the home. These differences were close to significance.

Table 2 shows that most parents agree "*it is okay for a person to have one or two drinks in the presence of small children"* but that it is not acceptable "*…to get drunk in the presence of small children"*. Furthermore, most parents agreed that "*most people my age drink in front of children occasionally*" and "*most people my age drink alcohol at gatherings where children are present*". Further comparison of mothers and fathers revealed that while a majority of fathers think it is not okay to get drunk in the presence of small children (70.1%), they were less likely to say this than mothers (80.9%) (χ^2 (df=2, n=670) = 10.6, p<0.05). Fathers (24.5%) were also significantly more likely than mothers (17.8%) to agree that a person can get drunk in the presence of small children if a sober person is present (χ^2(df=2, n=670) = 8.12, p<0.05).

Relationship between injunctive norms and drinking behaviour around children

The relationship between injunctive norms and drinking behaviour confirmed the relationship between perceptions of what others think and actual behaviour; there was a clear association among both mothers and fathers between thinking others would not approve of consumption and drinking behaviour. Parents who reported drinking each day or a couple of times a week in front of their children were less likely to agree with two scenarios negative about drinking in front of children (i.e. *'alcohol should not be used at all..', 'a person should not get drunk in the presence of small children'*), but more likely to agree with two scenarios positive about drinking ('*it is okay for a person to have one or two drinks..',' if there is some other person present who is sober and takes care of the children, a person can get drunk in the presence of small children').* To the contrary, drinking behaviour was not significantly related to descriptive norms.

Table 2. *Normative views about drinking in presence of small children (% agree), among respondents aged 18-59 with and without underage children and by drinking status*

	Total	**Parents**		**Men**[#]					**Women**[#]				
		Drink daily/couple times/week		Children		Age of children			Children		Age of children		
Injunctive norms .. in the presence of small children..	(N=1,000)	No (n=381)	Yes (n=227)	No (n=203)	Yes (n=261)	0-5 years (n=97)	6-12 years (n=85)	13-17 years (n=79)	No (n=125)	Yes (n=409)	0-5 years (n=191)	6-12 years (n=122)	13-17 years (n=96)
Alcohol should not be used at all..	40.6	**44.6***	**27.8***	39.9	36.0	40.2	32.9	34.2	44.0	43.5	48.7	39.3	38.5
It is okay for a person to have one or two drinks..	64.8	**63.3***	**75.3***	57.6	62.8	62.9	70.6	54.4	64.0	66.0	69.6	65.6	59.4
A person should not get drunk..	76.7	**80.1***	**69.6***	75.9	70.1	73.2	68.2	68.4	76.8	80.9	83.2	77.0	81.3
If there is a person present who is sober and takes care of the children, a person can get drunk..	20.4	**16.5***	**28.2***	24.5	29.6	24.7	32.9	15.2	**27.2***	**17.8***	19.9	19.7	11.5
Descriptive norms													
Most people my age drink alcohol in front of children occasionally	70.7	69.3	78.0	66.5	67.4	69.1	63.5	69.6	**72.9***	**63.2***	71.7	70.5	78.1
Most people my age drink alcohol at gatherings where children are present	69.9	70.1	73.1	65.5	65.5	70.1	61.2	64.6	**72.6***	**63.2***	73.8	71.3	71.9
Most people don't think about the fact that they are role models for children in regard to alcohol consumption	57.2	57.2	56.4	48.3	54.8	57.7	51.8	54.4	58.7	63.2	59.7	54.9	61.5

Bold with * = significant chi-square test across all categories at $p<0.05$ (agree, neutral, disagree with 95% CIs also checked for % agree)

[#] 2 respondents indicated that they were gender diverse (the total of 464 men and 534 women is n=998)

Parental drinking behaviour in front of one's own children

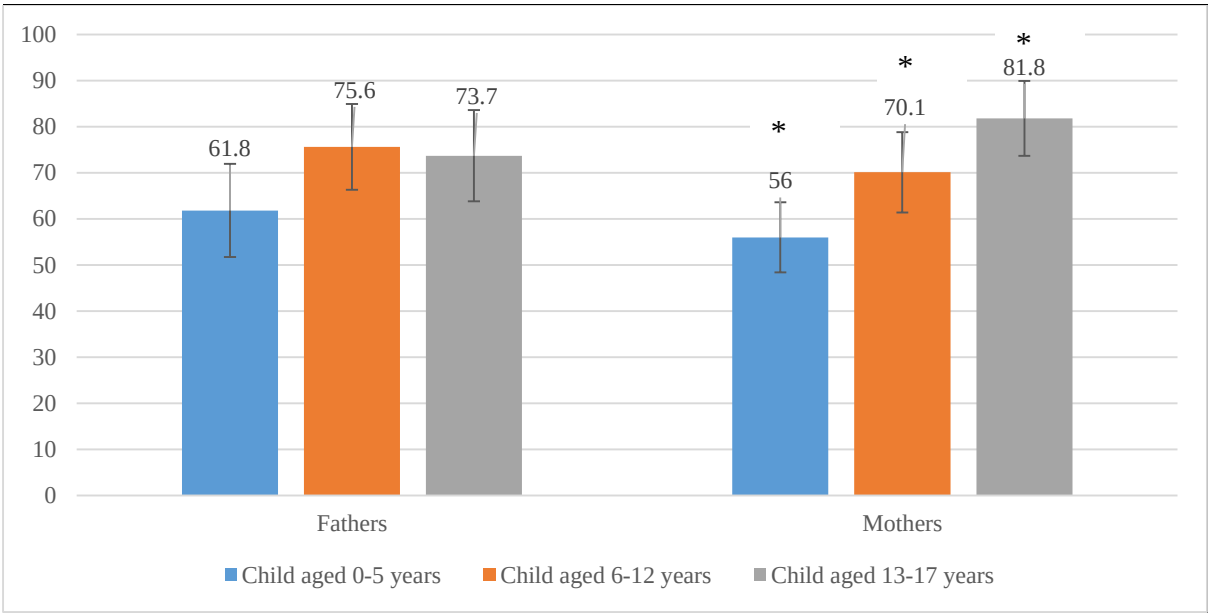
Hypothesis three predicted that age of the youngest child in the home and status as mother or father will impact drinking in the home, with the least consumption by mothers of young children. Results, as summarised in Table 3, supported this hypothesis. Overall, 37.3% of parents (44.9% fathers and 32.1% mothers) reported that they drank a glass of alcohol, 20.1% got 'slightly drunk' and 8.6% got visibly drunk each day or a couple of times per week when their children were present. Fathers were more likely to drink more regularly in front of their children (including drinking a glass of alcohol, getting slightly drunk and visibly drunk) than mothers. While frequency of drinking for men tended to be quite consistent, whatever the age of the youngest child in the home, mothers tended to increase frequency of drinking as the age of the youngest child in the home increased, suggesting that age of child did moderate consumption among mothers.

Moreover, 413 parents (62% of all parents or 67.9% of those who have drunk in the last year) reported that they "ever drank" alcohol at home with their children present. Figure 1 shows that there were no significant differences in reported alcohol consumption in the home for males by age of the youngest child in the home, but that there was an apparent gradient for women, whose reported consumption in the home increased with age of the youngest child. While it appears that women with children aged 13-17 years were more likely to report that they drink in front of their children at home than fathers, the difference was not significant.

Table 3. *Self-reported parental drinking behaviour in front of children among those who drank in the last year (%)*

	Total	**Fathers**	**Mothers**	**Fathers**			**Mothers**			Chi-square*
	(n=608)	(n=247)	(n=361)	0-5 years (n=89)	6-12 years (n=82)	13-17 years (n=76)	0-5 years (n=166)	6-12 years (n=107)	13-17 years (n=88)	
Do you drink a glass of alcohol..										
Each day/a couple of times per week when your child/ren are present	37.3 (33.5-41.1)	44.9 (38.7-51.1)	32.1 (27.3-36.9)	40.4 (30.2-50.6)	50.0 (39.2-60.8)	44.7 (33.5-55.9)	26.5 (19.8-33.2)	36.4 (27.3-45.5)	37.5 (27.4-47.6)	
A couple of times per month when your child/ren are present	24.2 (20.8-27.6)	26.3 (20.8-31.8)	22.7 (18.4-27.0)	20.2 (11.9-28.5)	26.8 (17.2-36.4)	32.9 (22.3-43.5)	16.3 (10.7-21.9)	29.9 (21.2-38.6)	26.1 (16.9-35.3)	
A couple of times per year your child/ren are present	24.3 (20.9-27.7)	17.4 (12.7-22.1)	29.1 (24.4-33.8)	22.5 (13.8-31.2)	18.3 (9.9-26.7)	10.5 (3.6-17.4)	31.9 (24.8-39.0)	24.3 (16.2-32.4)	29.5 (20.0-39.0)	
Never while your child/ren are present	14.1 (11.3-16.9)	11.3 (7.4-15.2)	16.1 (12.3-19.9)	16.9 (9.1-24.7)	4.9 (0.2-9.6)	11.8 (4.5-19.1)	25.3 (18.7-31.9)	9.3 (3.8-14.8)	6.8 (1.5-12.1)	a, c
Do you get more talkative and lively after drinking than usual..										
Each day/a couple of times per week when your child/ren are present	20.1 (16.9-23.3)	26.3 (20.8-31.8)	15.8 (12.0-19.6)	21.3 (12.8-29.8)	30.5 (20.5-40.5)	27.6 (17.5-37.7)	14.5 (9.1-19.9)	16.8 (9.7-23.9)	17.0 (9.2-24.8)	
A couple of times per month when your child/ren are present	19.9 (16.7-23.1)	22.7 (17.5-27.9)	18.0 (14.0-22.0)	24.7 (15.7-33.7)	20.7 (11.9-29.5)	22.4 (13.0-31.8)	15.1 (9.7-20.5)	22.4 (14.5-30.3)	18.2 (10.1-26.3)	
A couple of times per year you're your child/ren are present	23.0 (19.7-26.3)	18.2 (13.4-23.0)	26.3 (21.8-30.8)	18.0 (10.0-26.0)	15.9 (8.0-23.8)	21.1 (11.9-30.3)	25.9 (19.2-32.6)	24.3 (16.2-32.4)	29.5 (20.0-39.0)	
Never while your child/ren are present	37.0 (33.2-40.8)	32.8 (27.0-38.6)	39.9 (34.8-45.0)	36.0 (26.0-46.0)	32.9 (22.7-43.1)	28.9 (18.7-39.1)	44.6 (37.0-52.2)	36.4 (27.3-45.5)	35.2 (25.2-45.2)	a
Do you get visibly drunk (speaking unclearly, walking unsteadily)..										
Each day/a couple of times per week when your child/ren are present	8.6 (6.4-10.8)	12.1 (8.0-16.2)	6.1 (3.6-8.6)	14.6 (7.3-21.9)	11.0 (4.2-17.8)	10.5 (3.6-17.4)	7.8 (3.7-11.9)	7.5 (2.5-12.5)	1.1 (0-3.3)	
A couple of times per month when your child/ren are present	9.0 (6.7-11.3)	12.1 (8.0-16.2)	6.9 (4.3-9.5)	10.1 (3.8-16.4)	11.0 (4.2-17.8)	15.8 (7.6-24.0)	6.0 (2.4-9.6)	11.2 (5.2-17.2)	3.4 (0-7.2)	
A couple of times per year you're your child/ren are present	9.2 (6.9-11.5)	10.1 (6.4-13.8)	8.6 (5.7-11.5)	4.5 (0.2-8.8)	15.9 (8.0-23.8)	10.5 (3.6-17.4)	3.6 (0.8-6.4)	9.3 (3.8-14.8)	17.0 (9.2-24.8)	
Never while your child/ren are present	73.3 (69.8-76.8)	65.6 (59.7-71.5)	78.4 (74.2-82.6)	70.8 (61.4-80.2)	62.2 (51.7-72.7)	63.2 (52.4-74.0)	82.5 (76.7-88.3)	72.0 (63.5-80.5)	78.4 (69.8-87.0)	a, c

*a: chi-square <0.05 between mothers and fathers, b: chi square, p<0.05 between 3 age groups for fathers, c: chi square, p<0.05 between 3 age groups for mothers



*Significant difference at p<0.05 between all three categories for mothers

Figure 1. *Proportion of parents (who drank in the last year) reporting that they ever drink alcohol at their home with their children present by gender and age of the youngest child (n=413)*

Restriction of consumption among parents

Questions about the context in which consumption was restricted (a short-term goal) provided information from which to explore how circumstances impacted motivation in the moment. Table 4 shows reasons for restricting consumption (around children) in the home environment, at a restaurant and at a friends' house for a meal. Responses indicated that personal reasons such as to remain in control and be responsible (55.2% of responses 95% CI= 46.6-63.8) tended to outweigh responses focussing on being around children in the home (27.1% of responses 95% CI=19.4-34.8) as reasons for restricting consumption. Although not explicitly stated by respondents, being in control and responsible may also be related to perceived parenting responsibilities. Outside of the home, driving was a more important factor, influencing consumption when visiting restaurants (49.3%; 95% CI=38.0-60.6) and at friends' houses (40.0%; 95% CI=27.6-52.4), than concern about children (10.7%; 95% CI=3.7-17.7 and 13.3%; 95%CI=4.7-21.9). When results were compared for mothers and

fathers, in the home environment, fathers were significantly more likely to report restricting for personal health reasons and significantly less likely to restrict because the children were around than mothers. There were no differences by gender of the parent at restaurants or at a friend's house.

Table 4. *Reasons for restricting alcohol by context and gender of parent (among those that drank in the last year and said they visited those venues with their children) (%)*

% Restricted drinking at last occasion	At home, drinking in front of children (19.4% restricted drinking, n=129) %			At restaurant for a meal with children (11.2% restricted drinking, n=75) %			At friends' house for a meal with children (9.0% restricted drinking, n=60) %		
	Fathers (n=49)	Mothers (n=80)	Total (n=129)	Fathers (n=36)	Mothers (n=39)	Total (n=75)	Fathers (n=29)	Mothers (n=31)	Total (n=60)
Personal reasons									
At limit/to be sensible/responsible	18.4	16.3	17.1	2.8	12.8	8.0	24.1	16.1	20.0
Just want to socialise/relax	12.2	3.8	7.0	-	2.6	1.3	-	-	-
Don't want to get drunk	-	11.3	7.0	-	-	-	-	3.2	1.7
Personal health	**22.4***	**8.8***	14.0	2.8	-	1.3	3.4	9.7	6.7
Finances	6.1	-	2.3	11.1	2.6	6.7	-	-	-
To drive	4.1	2.5	3.1	52.8	46.2	49.3	44.8	35.5	40.0
Commitments next day i.e. work	6.1	3.8	4.7	2.8	-	1.3	-	-	-
Children									
Children around	**8.2***	**18.8***	14.7	5.6	10.3	8.0	6.9	9.7	8.3
To be responsible for children	6.1	12.5	10.1	2.8	2.6	2.7	3.4	6.5	5.0
Breastfeeding	-	3.8	2.3	-	-	-	-	-	-
Other	6.1	12.5	10.1	-	2.6	1.3	-	-	-
Invalid response	10.2	6.3	7.8	19.4	20.5	20.0	17.2	19.4	18.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: columns may not add up to exactly 100.0% due to decimal place rounding

*significant chi-square <0.05 between fathers and mothers

DISCUSSION

This study measured attitudes to drinking in front of children and how concern may vary for mothers versus fathers. We found that both males and females were more concerned about a mother than about a father drinking in moderation in front of a 10 year old child, a result that conflicts with Scheffels et al. (2016). Males were also less concerned about a father than about a mother getting clearly intoxicated a couple of times per week or month in front of a 10 year old child. It is possible that expectations of women in Australia as the primary care-giver of children may differ from those in Nordic countries, where family roles may be more equal (Baxter & Kane, 1995).

This study also confirmed that parents with younger children (0-5 years) were less supportive of drinking at all or having one or two drinks in the presence of small children than parents with older children. These findings contrast with those of Raitasalo et al. (2011) in Finland, who did not find a difference between respondents with younger and older children. They did, however, find that women tended to be stricter in their opinions than men, which was also confirmed in this study.

While these results need to be replicated in a representative population survey, they indicate that Australians tend to be generally accepting of what they consider to be moderate consumption - one or two drinks in the presence of children - but largely reject being drunk in their presence. Moreover, although our results cannot be directly compared with previously published Finnish data (Raitasalo et al., 2011), they suggest that Australians may have less strict views than those in Finland. While 41% in our sample agreed that alcohol should not be used at all in the presence of small children, 72% thought this in Finland, and 77% of Australians agreed one should not get drunk in the presence of small children compared with near universal agreement (95%) in Finland. In addition, the Norwegians may be slightly more

supportive than Australians of drinking a glass of wine in front of children, whereas they appeared less supportive of getting slightly intoxicated or clearly intoxicated than the Australians. Thus results indicate a culture in Australia more accepting of alcohol consumption (at least in moderation) in front of children than at least some other countries (Finland and Norway).

We found good congruence between beliefs and behaviour, so those that did not drink each day or a couple of times a week were less likely to agree that it is okay to have one or two drinks in the presence of small children. Unlike Raitasalo et al (2011), our study indicated that there was no conflict between attitude to drinking and behaviour. Our results also indicated that just over one in three parents reported that they drink a glass of alcohol each day or a couple of times per week. Overall, one in five reported that they get slightly drunk or more talkative and lively than usual, and one in twelve (8.6%) reported getting visibly drunk after drinking each day or a couple of times per week, which is concerning and incongruent with the Parenting Guidelines (Ryan et al., 2011). Fathers reportedly drank more, and more regularly, than mothers in front of their children; a finding that is not surprising given that drinking rates are higher in men than women (Bowden et al., 2014), and in fathers than in mothers (Bowden et al., 2018). There was no difference among fathers in reported drinking in front of children by age of the youngest child in the household, but mothers were less likely to report drinking a glass of alcohol each day or a couple of times per week if the child was younger (between 0-5 years). Mothers were also less likely to report that they got visibly drunk at least a couple of times a week if their child was aged 13-17 years. This partially confirms findings from previous Australian studies that age of the child in the household can be related to alcohol consumption among women (Bowden et al., 2018), and suggests that mothers may also see themselves as playing the key caring role with children. These findings, particularly the rates of drunkenness around children, taken along with the

fact that 55% of fathers and 63% of mothers agree that most people don't think about the fact that they are role models for children in regard to alcohol consumption, indicates that awareness is low. Given this low awareness, and that there was a link between attitudes and consumption, health promotion efforts aimed at raising awareness could have a potential impact in changing behaviour.

In addition, our exploratory investigations suggested that short-term motivations to restrict consumption were to be sensible or responsible (which, although not specified, may be in connection with parenting). When outside of the home, the predominant motivator for restricting drinking was around driving, rather than to set a good example to one's children. This result reflects effective public health campaigns in Australia that focus on the impact of drink-driving and enforcement of the law.

These results, combined, highlight that while parents may restrict their drinking to stay in control and in compliance of drink-driving laws, awareness of the effects of drinking alcohol in front of children may not be high. Further research might usefully examine the extent to which adults believe that role-modelling of alcohol consumption impacts later behaviour by their children.

It is important to acknowledge that data reported here have a number of limitations. First, data were collected online and from a volunteer sample, which may bias the representativeness of the sample. While relationships identified within the dataset are likely to be reliable, the present survey was not sampled, nor weighted to be generalisable to the population. Some results go against this possible bias; the sample has a similar demographic composition to the participants in the NDSHS survey, a sample chosen more probabilistically from the Australian population.

Second, the survey relied on self-report for measurement of alcohol consumption, and previous research has confirmed significant levels of underestimation. Thus, 55% of the Australian consumption measured by alcohol sales is covered by respondents' reports in the NDSHS survey (Livingston & Callinan, 2015); underreporting is associated with 'impression management' among some people (Davis, Thake, & Vilhena, 2010).

Overall, despite the limitations, the results demonstrate that the Australian adults in this study had a permissive attitude to moderate alcohol intake in the presence of children but considered "excessive" intake unacceptable. Men were more likely to drink alcohol in front of their children and tended to have a more lenient attitude. Attitudes tended to be consistent with behaviour; those that were less supportive of drinking in front of children were less likely to do so. While the evidence as to what constitutes a 'safe' consumption level, including in front of children, has not yet been identified, many parents currently exceed health guidelines, drinking to the point of drunkenness in front of children on a weekly basis.

The findings also indicate that although parents may restrict their alcohol intake in order to "be responsible" and to stay within the limits imposed by drink-driving laws, they are less motivated to alter their consumption on the basis of identification with their position as role models. This study highlights the need to target adults and parents consuming in excess of health guidelines and the many parents that are consuming alcohol at higher levels in front of their children, who are normalising over consumption for the next generation.

CHAPTER 6: CONCLUSIONS

6.1 Preamble

The overarching goal of the research studies described in this thesis was to identify the extent to which consumption of alcohol in a sample of Australians was negatively associated with peoples' knowledge of the long-term harms. This topic is worthy of investigation, given the strong current health interest in improving knowledge of short-term harms, including drink-driving campaigns, work place safety advice and domestic violence advocacy, and the relatively limited focus so far on long-term harms.

The theoretical framework that informs this thesis, the Transtheoretical Model of Change (Prochaska and DiClemente (1982)), suggests that behaviour change requires recognition and contemplation of the impact of a behaviour on valued health outcomes, both in the medium and longer term. Consequently, establishing the level of community knowledge about the long-term harms of alcohol consumption on health outcomes for the self and family members (e.g. children at an impressionable age) is a necessary first step to the design of interventions that might utilise knowledge of this risk to effect behaviour change. Furthermore, Bronfenbrenner's Ecological System Theory states that consumption can be influenced at many levels including the individual and community level (through norms) (Bronfenbrenner, 1979).

Two areas of likely poor general knowledge about risk provided the main foci of the research: the link between alcohol consumption and cancer risk, and the impact of parental attitude and behaviour on alcohol consumption among offspring. This chapter draws together findings from a series of four studies undertaken to investigate these research questions. While this chapter does not directly revisit the discussions contained within each of the four empirical chapters, it includes a summary of findings and situates these within the broader

literature. Considerations of how findings might be translated to policy in Australia are also outlined. The chapter concludes with a discussion of the limitations of the studies, their implications and recommendations for further research.

6.2 Brief Summary of key findings

6.2.1 Paper one: 'Alcohol consumption and NHMRC guidelines: has the message got out, are people conforming and are they aware that alcohol causes cancer?'

Paper one drew on cross-sectional surveys of approximately 2,700 South Australian adults aged 18 years and over in 2004, 2006, 2008, 2010, 2011 and 2012. Consumption data for 2011 and 2012 were merged for the majority of analyses. The results for 2011/12 indicated that 21.6% of adults drank in excess of the NHMRC guideline threshold for increased lifetime risk of disease (33.0% males; 10.7% females). While many respondents did not know what the guideline thresholds were, females were significantly more likely to correctly identify their guidelines threshold consumption levels than males (57.0% vs 21.6%). Among men, 38.0% thought that the threshold for men was higher. Awareness of alcohol as a "very" or "extremely" important risk factor for cancer, while higher than the 22.4% recorded in 2004, was still only 36.6% in 2012.

Awareness of alcohol as a "very" or "extremely" important risk factor for cancer was associated with males and females being less likely to exceed the guideline for increased lifetime risk. However, there was no association between likelihood of exceeding the guidelines and knowledge of the guidelines. Other important demographic factors associated with consumption in excess of the guideline for increased lifetime risk among men were: being separated, divorced or never married (compared with being married) and having a household income in excess of AUD $160,000 per annum. Among women who were more likely to exceed guidelines, important demographic correlates were: being de-facto,

separated, divorced or never married (compared with being married); and having a household income in excess of AUD $80,000 per annum.

6.2.2 Paper two: 'Prevalence, perceptions and predictors of alcohol consumption and abstinence among South Australian school students: a cross-sectional analysis'

A cross-sectional survey of 2,885 South Australian school students aged 12-17 years was undertaken to examine correlates of consumption behaviour among young people. The results revealed that alcohol use was higher in older ages, and by 16 most had tried alcohol, with 33.1% of students aged 12-17 years reporting that they drank at least occasionally. Students' judgement that alcohol had a "very" or "extremely" important link with cancer was only 28.5%. Correlates of awareness of the link varied with respondent age group; it was associated with lower likelihood of drinking for 14-17 year olds, but a higher likelihood of drinking among 12-13 year olds. For all ages, smoking status and friends' approval were associated with higher likelihood of drinking. Perceived parental disapproval was associated with lower likelihood of drinking for all ages. Among students aged 14-15 years, there was an association between those that ranked themselves as having "below average" abilities at school and being more likely to drink, and this association existed also for those aged 16-17 who rated themselves as 'average' or 'below average'. Increased available spending money was also associated with a higher likelihood of drinking for 16-17 year olds and 12-13 year olds. Greater likelihood of recent drinking (in the last 7 days) was associated with only two factors: smoking and the perception that alcohol was easy to buy.

6.2.3 Paper three: 'Parental drinking in Australia: does the age of children in the home matter?'

This paper utilised cross-sectional data from adults aged between 25 and 55 years obtained from the National Drug Strategy Household Survey collected in 2013 (n=11,591). The results showed that fewer Australian parents (18.2%) than non-parents (24.2%) drank in excess of the NHMRC guidelines for increased lifetime risk (greater than 2 standard drinks a day). A smaller proportion of parents (14.2%) than non-parents (21.2%) drank more than four drinks on one occasion, putting themselves at short-term risk from that occasion, at least once a week.

Age of the youngest child in the home did not make a difference to whether fathers exceeded the guidelines for increased lifetime risk (i.e. >2 standard drinks a day), whereas it did for mothers. Mothers were less likely to exceed the guideline for increased lifetime risk if their youngest child was aged 0 to 2 years, 6 to 11 years and 15 years and over. In relation to exceeding the guideline for increased short-term risk (i.e. more than 4 standard drinks at any one time), fathers were less likely to do this at least monthly or weekly if their youngest child was less than two years old. Mothers were less likely to exceed the guideline for increased short-term risk at least monthly or at least weekly if their youngest child was aged 0 to 2 years and 15 years and over. Parents were more likely to drink in the home compared with non-parents.

6.2.4 Paper four: 'Levels of parental drinking in the presence of children: an exploration of attitudinal and contextual correlates'

Paper four consisted of a cross-sectional online survey with 1,000 Australian adults (including n=670 parents) aged 18-59 years to assess alcohol consumption in front of children. Normative attitudes toward drinking and getting drunk in front of children,

perceived parental norms and place of consumption were assessed. The results revealed that 37.3% of parents reported drinking a glass of alcohol each day or a couple of times a week; 20.1% reported that they get slightly drunk and 8.6% reported getting visibly drunk with their children present. Fathers were more likely than mothers to drink, and to drink more regularly in front of their children.

Drinking behaviour was associated with attitudes; those who drank less than twice a week were found to be more likely to report that it is okay to have one or two drinks in the presence of small children than those who drank more than twice a week. Overall, respondents were less concerned about a parent drinking moderately (i.e. a glass of wine) in front of a 10 year old than a parent getting slightly intoxicated or clearly intoxicated in this situation. There was less concern by both males and females about a father drinking a glass of wine in front of a child than about a mother drinking the same. Overall, females tended to be more-strict in their views than males. Parents of children aged less than 5 years were more concerned than parents of children aged 6 to 17 about drinking at all, and about drinking one to two drinks, in the presence of small children.

Parents who reported they reduced their consumption within various contexts in front of their children on the last occasion were asked why. The results revealed that, in the home, parents tended to reduce their consumption and to display sensible and responsible behaviours. Among fathers, the most common reason given was for personal health reasons; for mothers, the most common reason was because the children were around. Outside of the home (i.e. at restaurants and friends' houses) the main reason given to restrict drinking was to avoid drink-driving.

6.3 Conceptual review of thesis findings: How do the findings inform the literature?

6.3.1 Consumption by Australian adults and parents

The research described in Chapter 1 highlights that much of the focus of alcohol consumption guidelines and public education has related to short-term impacts. However such approaches do not address the fact that some harms may result from long-term, cumulative consumption and that highlighting these impacts may provide an additional tool with which to motivate behaviour change. The results reported in the first empirical paper in this thesis indicated that just over one in five adults, and one in three males, consumed more than two standard drinks per day, putting themselves at increased risk of alcohol-related harm (disease or injury) over a lifetime. Other population data from the Australian Institute of Health and Welfare confirm these rates of increased lifetime risk; 17.1% of Australians (24.0% males and 9.5% females) exceeded the guideline in 2016 (Australian Institute of Health and Welfare, 2017). It is however possible that these results are an underestimate given the 2013 figure of 27.6% drinking in excess of the guideline for *increased risk of disease or injury throughout their lifetime,* yielded from the IAC study, which accounts for 86% of sales (Callinan et al., 2016).

The literature reviewed in Chapter 1 also highlighted the critical role that parents play, both indirectly, by role modelling of consumption behaviour in the presence of children (Yap et al., 2017), and directly, by parenting practices with alcohol (Laslett et al., 2017), rule setting and spoken or implied approval of consumption (Yap et al., 2017).

The results in this thesis indicated that more adults without children exceeded the guideline for increased lifetime risk of alcohol related disease or injury. Fathers were more likely to exceed the guideline than mothers, and the age of the child in the home did not appear to relate to the father's likelihood of exceeding this guideline, whereas the mother's

intake was less in the presence of very young infants, primary school-aged children, and senior high-school adolescents.

The differential impact of the presence of children on the mother's intake, with impact varying according to the child's age, warrants further examination. It is likely that the wide-spread promulgation of breastfeeding guidelines in Australia that recommend that pregnant and breastfeeding women should abstain from alcohol consumption partly explains reductions in consumption when infants up to 2 years are present in the home. This interpretation is only likely to be partially explanatory because in Australia in 2010, most mothers ceased breast feeding by the time the infant reached 5 months, at which time only 15% were still breast feeding (Australian Institute of Health and Welfare, 2010a).

A possible explanation for mothers being less likely to exceed the guideline for increased lifetime risk when the youngest child was in primary school could be influence from the requirements of returning to work. In an international study involving over 30 countries and testing Classic Role Theory[16], Kuntsche et al. (2009) confirmed that the larger the number of social roles an individual fills (i.e. partnership, parenthood and paid labour), the less likely they will drink heavily, because they have fewer opportunities to do so and because these roles may conflict with consumption.

Determining an explanation for the finding that women were less likely to exceed the guideline when they had older teenagers in the home requires more research; it may reflect the need to transport teenagers to social engagements and parties, and to participate in driving instruction, or it may be in response to maternal recognition of the importance of role-modelling of responsible behaviour to emerging adults in this transitional period.

[16] According to Role Theory, the "self" is socially defined with different contexts helping define acceptable and expected behavioural choices, including but not restricted to, alcohol consumption. It was initially promulgated by Mead and Morris (1934)

The gender difference in modelling of responsible alcohol consumption is consistent with general findings of greater maternal than paternal commitment to the management of care within "intact" Australian families. An Australian Bureau of Statistics (ABS) Time Use Survey of over 4,000 respondents confirmed that "compared to fathering, mothering involves not only more overall time commitment but more multitasking, more physical labour, a more rigid timetable, more time alone with children, and more overall responsibility for managing care" (Craig, 2006, page 259).

6.3.2 Impact of location of consumption on intake

The results presented in this thesis also highlight the importance of attention to location (or context) of consumption when developing programs designed to ameliorate long-term harm from consumption. As highlighted in the introduction and fourth paper, as a consequence of the laws and regulations that prohibit alcohol consumption in a number of environmental contexts and the higher price of alcohol in licensed premises, for many (79%) home becomes the main location for consumption (Australian Institute of Health and Welfare, 2017).

The finding that parents were more likely to consume alcohol in the home than adults without children has particular importance given: i) the potential impact of modelling on child behaviour; and ii) the potential of excessive consumption at home to impact on effective care giving. Knowledge of both potential impacts appears poor in participants in studies reported here, and requires further investigation. The final study provided further evidence about the absence of consideration of the impact of consumption in the home and in front of children, although this varies between mothers and fathers. Fathers appear likely to limit their consumption within the home setting primarily for personal health reasons, whereas mothers

indicate greater awareness of personal responsibility for children as a moderator of consumption.

6.3.3 Parental and peer approval influences consumption among school students

There is considerable variation among adolescents in the ages at which they start drinking at all, and start drinking with any regularity. The second cross-sectional study of this thesis indicated that, by the age of 16, most school students had tried alcohol. Various factors correlated with consumption. As expected, smoking was associated with greater rates of drinking "at all", as well as "drinking in the past 7 days" (recent consumption). Other factors associated with increased odds of drinking "at all" included amount of available spending money and below average self-reported ability at school.

Recent consumption among school students (i.e. having drunk in the past 7 days) was associated with smoking and students' agreement with the proposition that 'being able to buy alcohol easily encourages me to drink a lot'. While causation and directionality of the findings cannot be determined, this finding confirms other reports of an association between consumption by adolescents and availability (Rowland, Toumbourou, Satyen, Livingston, & Williams, 2014).

It was initially hypothesised that the influence of peer approval on consumption would increase with students' age, and that the influence of parents would decrease. Results indicated that both were important across all ages. This is a critically important finding because it highlights the need for parents to acknowledge their ongoing importance. Consequently the role that parents play is a critical consideration that should inform programs designed to achieve generational, cultural change in attitude to alcohol consumption in Australia. The finding that parental disapproval was important, notwithstanding the cross-sectional nature of the data, is consistent with at least some of the existing evidence

internationally. A meta-analysis (Yap et al., 2017), which extended the earlier review by Ryan et al. (2010), has confirmed the finding that parental approval of consumption is linked positively to increased earlier initiation and consumption among adolescents.

Although further longitudinal work is required to confirm the causal link between parent and child alcohol consumption, there is enough existing cross-sectional evidence, together with a small body of longitudinal data, for public health authorities to consider strategies for utilising parents to achieve cultural and generational change in attitudes to alcohol. Parents should be encouraged to recognise that their approval, or otherwise, of consumption may influence consumption choices of their children. Such advice is consistent with results from longitudinal studies in other countries, which have confirmed that having strict rules about alcohol consumption results in delayed initiation (Van Der Vorst, Engels, Meeus, & Dekovic, 2006). Moreover, a recent review concluded that, despite complexity in the underlying mechanisms and the need for further hypothesis-driven testing, the current weight of evidence suggests that parents should be discouraged from providing their children with alcohol in the home and encouraged to support abstinence until the attainment of the legal drinking age (Kaynak, Winters, Cacciola, Kirby, & Arria, 2014).

Results reported here confirm the complex nature of factors contributing to initiation of adolescent drinking and the maintenance of this behaviour. It is recommended in section 6.7.2 below that further research investigate students' interpretation of perceived availability to determine whether ease is related to financial ease, access through parents and friends, or physical accessibility through compliant outlets, or a combination of these and other variables.

6.3.4 Knowledge about long-term risk of alcohol and the link to cancer

As outlined in Chapter 1, health guidelines are developed on the basis of close examination of research evidence. They are promulgated to help health professionals and the general public understand the influence of behavioural and environmental risks on health outcomes.

The results in this dissertation indicated that, although just over half of the female participants were able to correctly identify the 2009 guideline for reducing the lifetime risk of harm from alcohol-related disease or injury for women, one third could not. Results were even more concerning for men; only one in five could correctly identify the guideline, with one in three overestimating the amount that conferred risk and nearly half not knowing the guideline. These findings suggest that men, in particular, may be guided in their consumption by the more "generous" recommendations for men of the earlier guideline ("four for men and two for women").

The finding that awareness of the more recent Australian guideline was low overall was consistent with results reported by Livingston (2012). Low awareness of guidelines has also been demonstrated in studies in other developed countries (Bendtsen et al., 2011; de Visser & Birch, 2012; Sellman & Ariell, 1996). The most recent Australian data, collected in 2018 by the Foundation for Alcohol Research and Education (2018), indicated that men were more likely than women to overestimate the number of standard drinks linked to long-term harm. This study, although not directly comparable, confirmed less than optimal knowledge of guidelines, notwithstanding a slight improvement through time. Thus, while 38% of adults correctly recalled the guideline to mitigate lifetime harm in 2011, by 2018 the estimate improved to 42%. The small size of this change is unsurprising given that paid government publicity about the guidelines and unpaid Australian media coverage have both been minimal (Wolfaardt et al., 2018).

The changing nature of guidelines, with occasional updates released following the accumulation of new evidence, creates challenges for health communication. Moreover, as the Transtheoretical Model and various social cognitive models of health behaviour indicate, awareness linked to improved knowledge, and even attitudinal change, does not necessarily predict behaviour change (Armitage & Conner, 2000; Sheeran, 2002). Consistent with this, results from the first study in this thesis did not find a link between awareness of the guidelines and lower likelihood of exceeding the guideline for lifetime risk. It is not possible, within this research design, to determine whether increases in awareness within individuals would result in decreased consumption. These findings do, however, indicate that public health messaging that simply highlights the guidelines in isolation may not be sufficient to promote behaviour change.

Conversely, other results confirm that knowledge may have some impact on alcohol consumption behaviour; an Australian study by Bowring et al. (2012) found that young adults aged 16 to 29 years were less likely to exceed guidelines if they had an accurate understanding of the guidelines. Contradictory findings may reflect differences in the measures used or the sample recruited, including differences in ages, education or socio-economic status. Further research is required to identify variables that mediate the relationship between improved knowledge and behaviour change, or variables that moderate the association. Among these might be the nature of the message being promulgated and the extent to which it resonates with different groups within the population.

As outlined in the introduction to the thesis, there is a confirmed association between alcohol and cancer. The World Health Organization advises that alcohol is linked to a range of cancers and further confirms that the risk increases with the amount consumed (World Health Organization, 2018a). A message around lifetime harm reduction that focuses on knowledge of this association has the potential to impact behaviour more than a message that

just provides the NHMRC guidance alone, because cancer is a feared disease in many cultures, including Australia (Blendon & Georges, 2011; Borland et al., 1994). A recent systematic review by Vrinten et al. (2017) indicated that a large segment of the general population describe cancer as "the enemy", and that the best self-protective strategy was "to keep the enemy at bay" by controlling risks, although few respondents in the studies included mentioned lifestyle factors such as changing diet and exercise. Mass media campaigns were seen as encouraging early detection behaviours because they brought the proximity of cancer closer by highlighting the risks. There was, however, another widely held attitude to cancer in the study, best illustrated by the quote "ignorance is bliss" and "what you don't know, you don't worry about". In this study, this belief was related to reduced-likelihood of undertaking screening behaviour (Vrinten et al., 2017), but the same may be true for taking actions to prevent cancer.

These two opposing views demonstrate the potential for the message about alcohol and cancer to lead to either a fight or a flight response, thereby amplifying the public health challenge (Vrinten et al., 2017). This observation is consistent with review evidence presented by Ruiter, Abraham, and Kok (2001) who highlighted the importance of distinguishing between messages leading to an affective reaction – fear – and messages that result in a heightened cognitive threat perception paired with a high level of response efficacy and confidence in capacity to deal with the threat. The former may be ineffective and even damaging, whereas the latter may prompt behaviour change. Altogether, research suggests that a nuanced approach to the promulgation of messages highlighting the long-term risk of consumption is required in order to motivate behaviour change.

Results reported in this thesis indicate that, while there has been an increase in awareness among Australian adults of the important link between alcohol and cancer, there are still large segments in the population who appear unaware. Knowledge of the association

between cancer and alcohol consumption was greater among females. This may reflect the emerging messaging around alcohol and breast cancer incidence, including messages disseminated through non-government organisations that support breast cancer awareness (e.g. Breast Cancer Network Australia; Cancer Council Australia; the American Cancer Society). Furthermore, adults who were aware of the link between alcohol and cancer were less likely to exceed the guideline for increased life-time risk. These findings suggest that appropriate, targeted messaging on the topic may resonate.

In support of this, past public health campaigns designed to highlight lifestyle choices that influence cancer risk have been successful, most notably in achieving high community knowledge of the link to smoking. Thus, in Australia, following many years of public health campaigning, 92.3% of the population indicate awareness of the association between smoking and cancer, as demonstrated in the results of the first paper of this thesis. Increasing knowledge of the long-term harms of smoking, including cancer, has played a fundamental role in achieving population behaviour change. Success in previous campaigns that have challenged highly entrenched behaviours indicates that increasing population knowledge of the link between alcohol and cancer may facilitate reduced consumption in some people; however, it is also known that knowledge of the link will not be sufficient to bring about change in others. Nonetheless, given that knowledge would appear to be currently low, an education campaign may be a good starting point. Scheideler and Klein's (2018) recent review of knowledge, based on 32 studies across 16 countries, concluded that awareness of the link between alcohol and cancer varies around the world and is modest overall, even though it has improved signiticantly over the last 30 years.

Data on awareness of the cancer and alcohol association among school students were also collected in the research reported here, and found to be lower than among adults (at 28.5%; see the second study in this thesis). This awareness of the link seemed to be

associated with less likelihood of drinking for 14-17 year olds, but was associated with increased likelihood of drinking among 12-13 year olds. It is not possible to discern definitive reasons for this, with a variety of possible explanations. It may reflect a statistical anomaly, or an increase in awareness of the link between alcohol and cancer with age, or that those who are drinking at the age of 12-13 are a different cohort entirely, with these young people a more "deviant" group.

Poor knowledge of the cancer and alcohol link across age groups suggests that addressing this is an important first step in public health education. Nelson et al. (2013) argued the need for clear and consistent statements by public health and medical communities, informing the general public that alcohol is a known carcinogen. Additionally, this message should be paired with increased exposure to the most recent NHMRC guidelines about reducing risk of lifetime harm from consumption. The findings of this thesis are timely given that the NHMRC are currently reviewing the alcohol guidelines and were scheduled to release them at the end of 2018. These results support the possibility that a communication strategy accompanying these guidelines may increase awareness, a necessary first step in behaviour change. Health promotion messaging that focuses on both the guidelines and cancer risk jointly (e.g. through mechanisms including media campaigns, warning labelling on alcohol, and advice promulgated through health professionals) may improve intention to change consumption more than a message that targets either alone. This is because the focus on cancer identifies the potential nature of the long-term harm addressed in the guidelines, thereby improving salience.

Some further evidence suggests that knowledge about long-term harm from cancer gathered through one mechanism (e.g. through exposure to public health guidelines) can motivate support for interventions delivered through different approaches. For example, Buykx, Gilligan, Ward, Kippen, and Chapman (2015) reported that those that were aware of

the link between alcohol and cancer had 30% to 60% higher odds of supporting alcohol policy options including: increasing price; reducing availability; banning alcohol sponsorship of sport; and including alcohol guideline information and health warnings on containers.

6.3.5 Parents as role models for alcohol consumption

It is likely that health education strategies, while important to behaviour change, would be more effective when paired with generational changes in expectations about what constitutes "normal" behaviour. Evidence shows that expectancies about alcohol use are set in childhood (Biederman et al., 2000; Miller et al., 1990), and parents have an important role to play as models and rule-setters for alcohol consumption (Yap et al., 2017).

In the context of role modelling, the evidence is not yet clear as to what level of consumption, if any, is appropriate in front of children. The Australian *Parenting Guidelines for Adolescent Alcohol Use* encourage parents to *limit* their alcohol use particularly around children and that *parents should not get drunk*, especially in front of their children. Lack of clear definition makes measurement of compliance with these guidelines difficult, and mitigates any possible beneficial impact. Nonetheless, highlighting to parents that they have some responsibility in this domain is, once again, a necessary first step before parental behaviour change is likely.

Knowledge of their importance as role models also provides a chance to leverage this knowledge to achieve reductions in adult intake. Results reported in the final study of this thesis highlight that one in three parents are drinking a glass of alcohol each day or a couple of times a week in front of their children. Moreover, one in five parents reported that they get "slightly drunk" and about one in ten "visibly drunk" each day, or a couple of times a week, with their children present. Fathers were more likely to report drinking in front of their children more regularly and to a greater extent than mothers. This is consistent with the

findings that men were more likely to exceed the guidelines than women and also that fathers were more likely to exceed guidelines than mothers.

Despite the prevalence of excess consumption, to the point of drunkenness, the research reported here also found that the samples largely rejected being drunk in front of children, although they were generally accepting of "moderate" consumption in such circumstances. Parents with younger children (aged 5 years or less) were less supportive of drinking in the presence of small children than parents with older children, with women having the strongest views. There were also apparent gender differences; respondents were less concerned about a father drinking one or two drinks in front of a child than a mother. This contrasts with findings from an online survey of 2,171 Norwegians aged 18-69 years old by Scheffels et al. (2016), who did not find a difference in attitude by gender of the parent. This difference may reflect differing national expectations of men and women (with women being viewed as having greater responsibility for care-giving in Australia than in Nordic countries) (Baxter & Kane, 1995).

Consistent with the above, a study of approximately 2,000 Finnish adults aged 19-59 by Raitasalo et al. (2011) revealed that a larger proportion of Finnish participants think that alcohol should *not* be used in the presence of small children than the Australian sample (72% vs 41% respectively). They were also more likely than the Australian sample to agree that one should not get drunk in the presence of small children (95% vs 77% respectively). Furthermore, when compared with the Norwegian sample, the Australian sample appeared less concerned about getting intoxicated in front of children. While these Australian results should be replicated in a representative population sample, they indicate a culture more accepting of alcohol consumption than other countries such as Finland and Norway.

Promisingly, the fourth study in this thesis reported good congruence between attitudes to alcohol and consumption behaviour; those who drank less than twice a week were

less likely to agree that it is okay to have one or two drinks in the presence of small children. This finding, in addition to the fact that more than half of fathers (55%) and mothers (63%) agreed that "most people don't think about the fact that they are role models for children in regard to alcohol consumption" indicates that awareness of the importance of this role may be poor. It is, however, possible that these responses were subject to response bias, with respondents putting themselves in a more favourable position by agreeing with the statement essentially about themselves compared to 'others'. The potential of this bias to obscure the true result highlights the need for further work. These results do indicate, however, that health promotion efforts aimed at raising awareness could have potential impact in changing parent behaviour, and consequently, child behaviour in the short, medium and long-term.

The results also highlighted that parents tended to report limiting their consumption when inside the home "to be sensible or responsible" (rather than specifying for their children, although the two may be connected). When outside the home, the main motivation for reducing consumption was to drive rather than to set a good example to children. These results indicate that parents are less likely to restrict their drinking as a result of their children than to stay in control or to drive. While the drink-driving laws have a substantial deterrent effect, it is also likely that lack of awareness about the importance of parents as role models and an associated lack of motivation are playing a role in this behaviour. Further research is recommended to examine the extent to which adults believe that role-modelling of alcohol consumption affects later drinking behaviour by their children.

6.4 What has been done in Australia to educate parents and has it worked?

To date, one national television campaign was run in Australia in 2009 to raise awareness among parents about their role as role models for responsible alcohol

consumption. This campaign was funded by DrinkWise[17] and involved a visual depiction of parents drinking at a barbeque: a father asks his son to get him a beer, the son then walks to the fridge and takes out a beer, he then turns into an adult drinking the same beer (highlighting the flow-on effects). This (now grown-up adult) then asks his son to get him a beer. Then there is a voiceover, 'kids form their attitude to alcohol long before they ever have a drink themselves: their most important role model – you' (DrinkWise, 2009b). The campaign evaluation methodology has not been released, but the results summarised in an online report indicated that 33% of parents surveyed said they thought more about how they drink around their kids and 28% said that they had reduced the amount of alcohol they drink in front of their children in the 12 months following the campaign (DrinkWise, 2009a). The Australian Government has not run any paid mass media campaigns to increase national awareness among parents of the importance of role modelling. However, a consortium of groups in Western Australia, in collaboration with the Western Australian Government, have run two campaigns focussing on the effects of alcohol consumption on adolescent development and reasons for parents not to supply their children with alcohol. The first advertisement, aired in 2012 was named 'Parents, Young People and Alcohol Cogs'. This campaign involved a visual depiction of moving cogs, while a voiceover stated 'a child's brain continues to develop until their early twenties: as a parent, you need to know that alcohol can affect your child's developing brain...' (with explanation as to the parts of the brain and cognition affected). The ad then finished with the tagline and voiceover – 'Under 18. No alcohol. The safest choice' (Government of Western Australia, 2014b). The second campaign was named ''Parents, Young People and Alcohol 'I see' ''. This campaign involved a brief statement from a taxi driver, a senior school psychologist, a paramedic and a doctor,

[17] DrinkWise is funded by the alcohol industry and has received substantial criticism by public health experts as motivated by a desire to create the impression that the alcohol industry is socially responsible (Miller, de Groot, McKenzie, & Droste, 2011)

describing the negative effects of young people drinking. It ended with a tagline ‘Under 18. No alcohol. The safest choice’ accompanied with a voiceover ‘we all want to see our children reach their full potential, that’s why no one should supply alcohol to under 18’s’ (Government of Western Australia, 2014a).

Campaign evaluation results revealed that both campaigns achieved high awareness and high ratings of relevance and believability (Johnston et al., 2018). Importantly, there was an increase in parent awareness of the NHMRC guideline recommending no alcohol for people under the age of 18. In terms of behaviour change, results were mixed. Parents were more likely to have recently discussed alcohol-related issues with their child at the completion of both campaigns, compared to parents surveyed prior to the campaigns. However, there were no significant reductions in parental supply of alcohol to their child – although this was not adequately measured, since the question was about “ever supplying alcohol to a child”, making it impossible to tease out intervention effects. Overall, these findings indicate that campaigns may assist in increasing parental awareness and may also change parental behaviour, but behaviour change can be a more complex issue and is not necessarily a direct consequence from increased awareness.

6.5 Study limitations

Some aspects of the designs, sampling and measures used in the studies limit interpretation, generalisability and the conclusions that can be drawn from the findings in this study. These key limitations are described in the following paragraphs.

6.5.1 Methodological considerations

All four studies in this thesis were cross-sectional and correlational; therefore only associations can be determined and causality and direction cannot. Furthermore, while studies

one to three were population surveys, with data weighted to be generalisable to the Australian community, study four was an online survey, that used non-probability sampling with quotas to achieve a sample size with sufficient power to detect statistically significant relationships between key variables. Study four was designed to investigate relationships between variables rather than to obtain population prevalence estimates; further research is needed to confirm generalisability of these associations. Nevertheless, the detection of significant relationships in study four indicates that there is merit in repeating the study using a probability sample, with data weighted by age, sex and probability of selection, to explore whether the findings apply to the broader population.

6.5.2 Scope

As outlined in the first chapter of this thesis, it is important to acknowledge that alcohol uptake, consumption and excess consumption all occur with influence from many intrinsic and extrinsic factors, including the broader environment (cf., Bronfenbrenner's Ecological System Theory (Bronfenbrenner, 1979)). However, due to resource constraints (i.e. the cost of including questions in population health surveys), and the very nature of research requiring tailored methodologies to answer specific research questions, the studies in this thesis pursue somewhat narrow lines of enquiry generated from the literature. The analyses do not attempt to measure the impact of all of these influences within each study, but it must be acknowledged that they exist, and that the findings only contribute to part of the broader body of evidence.

6.5.3 Measurement

In addition to the limitations of the cross-sectional design of the studies and their limited scope, the survey tools themselves have some limitations. The research in this thesis

relied on self-report data for measurement of alcohol intake, and studies have shown that people tend to underestimate their consumption (Kerr et al., 2009), possibly because of social desirability and 'impression management' (Davis et al., 2010). Problems with the data may also arise because of poor knowledge of the "standard drink", understanding of which is critical to successful completion of the studies. The concept of a "standard drink" is not well understood (Kerr & Stockwell, 2012) and, even though participants were provided the standard drinks guide (Australian Institute of Health and Welfare, 2013) in the questionnaires, data on utilisation and understanding of the guide were not collected. If respondents did not understand or attend to the prompt card, data reliability would be affected and respondents are therefore likely to underestimate their consumption, given the established tendency to underestimate the size of a standard drink (Kerr & Stockwell, 2012).

The survey tool used in studies 1 and 2 to assess perceptions of the link between alcohol and cancer, also have some major limitations. Participants were asked to rate the importance of three factors (smoking, pollution and alcohol consumption) in increasing a person's risk of getting cancer on a five point scale (1= "not at all important", 2= "slightly important", 3= "moderately important", 4= "very important" and 5= "extremely important"). Responses were then collapsed into two categories; 1. "very" and "extremely" important or 2. "not at all", "slightly" or "moderately" important.

There are several limitations with this approach. Firstly, the term "importance" was not defined for respondents and therefore may be misinterpreted by some as importance for government, or in terms of personal absolute or relative risk. Furthermore, the question does not describe the level of alcohol consumption as related to importance, and respondents may respond to this question differently depending on level of consumption (i.e. moderate drinking vs heavy drinking) with respondents potentially rating heavier drinking as being more important in increasing cancer risk compared with more moderate drinking. Another

limitation is that the response categories were coded in such a way as to allow ready comparison of perceptions of the link between alcohol and cancer, pollution and smoking. This means however that some of the detail in the data (collapsing down from 5 categories to two categories) may have been too simplified and it is possible, for instance that many people feel that there is a "slightly important" link but not a "very important" link, a distinction which has not been captured in this analysis. Furthermore, this approach makes the analyses less powerful because there is less variability in outcomes. Future surveys and analysis should outline importance, include a level of drinking, and report results for all categories.

Furthermore, the survey item designed to assess the association between availability of alcohol and consumption among students 'being able to buy alcohol easily encourages me to drink a lot' was ambiguous and could be interpreted in terms of physical accessibility of outlets, or accessibility from parents, peers or family, or financial means. It is recommended that further questions be included in surveys in future to analyse this issue in more detail because each conclusion has different implications for policy and health promotion messaging.

6.6 Policy implications of the findings

6.6.1 Alcohol consumption patterns differ between genders

Three studies in this thesis suggest that males, including fathers, are more likely to exceed long-term drinking guidelines (and also short-term guidelines) than females, including mothers. If lessons learned from other public health challenges, including tobacco control, are applied to an education and behaviour change strategy, adults would be targeted to change their behaviour because their behaviour may model bad choices to children. Whether this approach would be more successful than targeting children directly is an empirical question that warrants further research. Adults, as role models, are in the position to initiate and

support generational change in attitude to alcohol and consumption behaviour. Given the higher likelihood of exceeding the guidelines among men and fathers, men should be the primary focus of public health campaigns with the aim of improving their knowledge of long-term harms and cancer risk.

6.6.2 The need for public education about the risks of long-term cumulative consumption

The work presented in this thesis supports the proposition that a community awareness strategy may redress current gaps in knowledge of the long-term risks of regular consumption in excess of the guidelines. The first two studies of this thesis have been provided to the South Australian Government via face-to-face briefings with policy makers. They have also been provided to the Australian Government via a written submission to the Draft National Alcohol Strategy 2018-2026 consultation, to inform their goals and strategies. Prior to such a public education strategy being developed, further research is required as outlined in section 6.7.

6.6.3 The need to educate parents about the role of parental disapproval and other risk factors

The second study of this thesis indicates that perceived parental disapproval of children's consumption was associated with school students being less likely to drink. This is a readily modifiable behaviour by parents. The 'Australian Parenting Guidelines for Adolescent Alcohol Use' were developed based on results from a review by Ryan et al. (2010). This review concluded that, due to the mixed findings relating to the association between perceived parental disapproval and consumption, parental disapproval did **not** play an important role. The guidelines do, however, state that '*Parents should not present a*

permissive approach to alcohol, as this can increase the likelihood of alcohol misuse by their adolescent child'(Ryan et al., 2011, page 16). The findings presented in this thesis support the approach in these guidelines.

Notwithstanding the complexity of the association, the correlational results reported here suggest that perceived parental disapproval may play an important role in influencing adolescent consumption in Australia. Furthermore, this study showed a link between available weekly spending money and drinking at all for those aged 12-13 and 16-17 years old, indicating that parents should be aware of the link between access to money and consumption. Self-reported ability in school was also an important correlate of consumption for school students aged 14-17; those who were less confident in their abilities were more likely to drink. These findings confirm previous associations found between more weekly spending money and consumption (Bellis et al., 2007) and self-reported performance at school (Balsa et al., 2011). Parents, teachers and the wider community should be alerted to these risk factors for alcohol consumption in adolescence.

6.7 Future research directions

6.7.1 Investigate the potential impact of messaging among those that are dependent drinkers

Data reported in this thesis identified an association between awareness of the link between alcohol and cancer and reduced likelihood of exceeding the guideline for lifetime risk among both males and females. Alcohol dependence is defined by the World Health Organization as "a disorder of regulation of alcohol use arising from repeated or continuous use of alcohol. The characteristic feature is a strong internal drive to use alcohol, which is manifested by impaired ability to control use, increasing priority given to use over other activities and persistence of use despite harm or negative consequences. These experiences

are often accompanied by a subjective sensation of urge or craving to use alcohol. Physiological features of dependence may also be present, including tolerance to the effects of alcohol, withdrawal symptoms following cessation or reduction in use of alcohol, or repeated use of alcohol or pharmacologically similar substances to prevent or alleviate withdrawal symptoms. The features of dependence are usually evident over a period of at least 12 months but the diagnosis may be made if alcohol use is continuous (daily or almost daily) for at least 1 month" (World Health Organization, 2018b, section 6C40.2). Alcohol dependence was not addressed within the scope of this thesis and it is likely that those who are dependent would require different supports for behaviour change than those that are applicable in the general population of alcohol drinkers. It is recommended that future studies include both alcohol "dependent" and "not-dependent" samples in order to test the impact of messaging focussed on long-term risk for cancer, and/or impacts on children's consumption.

6.7.2 Examine self-reported ease of access among school children

As outlined earlier, the second study highlighted that perceived ease of access among school children was related to increased likelihood of being a regular drinker (i.e. drank in the past 7 days). Further research with young people is recommended to investigate their interpretation of ease of access. For example, are perceptions related to financial ease, physical accessibility or parental and peer supply? Such findings would have implications for policy and educational practices, particularly in response to retail availability and parenting strategies respectively.

6.7.3 Conduct a longitudinal study to determine whether the correlates found in the cross-sectional studies in this thesis are confirmed as causal

This thesis identified a number of important variables associated with adolescent consumption including: smoking; available spending money; self-reported schooling ability; perceived parental disapproval of alcohol consumption; perceived friends' approval of alcohol consumption and awareness of the link between alcohol and cancer. It also suggested that smoking, and the perception that alcohol purchase was easy were linked with regular consumption. It is important to test these variables in a longitudinal research study, including children (potentially pre-adolescence) and their parents to further understand the sequence of events, timing and chronicity of exposures. In addition, this thesis did not include other important influences on consumption such as parental provision of alcohol to children, which should be included in the longitudinal study.

6.7.4 Conduct an expanded, representative survey with Australian parents

The last study in this thesis highlighted potential cultural differences in normative beliefs about drinking in front of children held by parents in Australia, Sweden and Norway. It is important to note that the Australian study was conducted with a panel of paid volunteers and it is recommended that the survey be conducted again with a representative sample from the population. Testing of this representative sample should be expanded to investigate parental understanding of their impact as role models on later alcohol consumption by their children. It should also assess parental awareness of NHMRC guidelines for adolescents, because, as highlighted in the first chapter, if awareness of the guidelines is low, then parents are less likely to encourage adherence to them.

6.7.5 Further understand how people interpret guidelines and develop and test the impact of potential messaging in an experimental setting

This thesis highlighted gaps in knowledge of the long-term risks associated with drinking among the Australian community. A natural extension of the studies presented here would be to conduct a study to better understand how people interpret the current guidelines and lifetime harms of alcohol consumption and to directly examine whether a focus on the increased risk of cancer is a motivating factor to improve intention to reduce consumption.

Given the higher rates of excess consumption among men, and the fact that they were less likely to know of the important link between alcohol and cancer compared to women, potential messaging and its likely impact should be investigated across the community, but particularly among men. Messaging should be developed and focus tested with parents, including messaging of the link between alcohol and cancer, the guidelines for lifetime risk and the role of parents as role models in their child's consumption. Participants should be encouraged to consider whether the message taught them something new, conveyed believability, was relevant to them and made them "stop and think" about their consumption (or their consumption in front of their child).

The messages that rate most highly in focus testing (particularly among men and fathers) could then be tested in an experimental, within-subjects message rating web-based study, utilising an Australian protocol that has successfully identified the relative impact of other health messaging advertising (Durkin, Bayly, Cotter, Mullin, & Wakefield, 2013). Questions should assess intention to change (e.g. "to what extent would this message make *you* motivated to…?") and persuasiveness (e.g. "made me stop and think", "taught me something new", "was easy to understand", "was effective", "made a strong argument for…", "made me feel concerned about…"). Modelling could then be undertaken with the results from the experimental study to assess the financial costs and benefits of implementing a

national media campaign for the message that tests most favourably, in terms of indicating increased awareness and motivating potential behaviour change.

6.8 Final comments

Alcohol consumption in Australia is commonplace, and most Australians do not consume in excess of alcohol guidelines. There are, however, certain segments of the population that are drinking in excess of the guidelines, including the guideline for increased lifetime risk. These are more usually men, including fathers. By doing so, they put themselves at increased risk of alcohol-related disease and harms and they normalise over-consumption. This may have flow-on effects for the next generation, particularly given the importance of role-modelling.

Furthermore, a vast majority of men and, to a lesser extent, women are unaware of the guideline for minimisation of lifetime risk, and the majority are not aware of the link between alcohol and cancer. In research terms, evidence, while clear, is relatively new and there has been a gap in translation of this scientific knowledge to community awareness. Australian data show that the community believes that the government could and should have a role to play in highlighting the longer-term risks to the community (Foundation for Alcohol Research and Education, 2018).

The results in this thesis confirm that although communication of these risks may not change behaviour, as indicated in the first study, it is likely to, at the very least, increase awareness, which is currently very low and reflects the previous guidelines for men. It is important to acknowledge that in an environment where the alcohol industry are spending in the order of AUD $220 million per annum promoting their products (White et al., 2015), and where alcohol is widely available and relatively affordable, increased awareness may not translate to behaviour change.

The challenge is made even more difficult by the finding that, on occasion, alcohol is consumed to excess in homes with children present, raising the risk of short-term harm in addition to the long-term harm associated with ongoing consumption. Overall, the thesis findings highlight the importance of starting a conversation with the broader community that addresses both the short and long-term harms of alcohol. This conversation can include guidance about best parenting practice with alcohol. At the very least, consistent messaging will initiate consideration of behaviour change, although the true beneficiaries of this may not yet be born.

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APPENDIX A: CONFERENCE PRESENTATIONS AS A RESULT OF THIS THESIS

1. Bowden J, Delfabbro P, Room R, Miller C, Wilson C. (2013, May 8-10). Alcohol consumption: The latest NHMRC guidelines to reduce life-time risk; has the message got out, are people conforming and are they aware that alcohol causes cancer? Paper presented at the *Behavioural Research in Cancer Conference*, Adelaide, South Australia.

2. Bowden J, Room R, Delfabbro P, Miller C, Wilson C. (2014, December 3-6). Alcohol: a population study of predictors of consumption and awareness of the link with cancer. Paper presented at the *2014 World Cancer Congress*, Melbourne, Australia.

3. Bowden J, Room R, Delfabbro P, Miller C, Wilson C. (2015, May 15-17). Alcohol: a population study of predictors of consumption and awareness of the link with cancer. Paper presented at the *Behavioural Research in Cancer Control Conference*. Sydney, Australia.

4. Bowden J, Room R, Delfabbro P, Miller C, Wilson C. (2017, October 21). Adolescent and parental alcohol consumption in Australia: do parents' opinions matter? Poster presented at the *2017 State Population Health Conference*. Adelaide, Australia.
   ** Note: Awarded best poster*

5. Bowden J, Room R, Delfabbro P, Miller C, Wilson C. (2017, October 31). Alcohol: predictors of alcohol consumption: does knowledge of the link between alcohol and cancer matter? Paper presented at the *South Australian Health and Medical Research Institute Annual Scientific Meeting.* Adelaide, Australia.

6. Bowden J, Room R, Delfabbro P, Miller C, Wilson C. (2017, November 12-15). Parental drinking in Australia: testing the impact of presence of children in the home. Paper presented at *The Australasian Professional Society on Alcohol and Other Drugs.* Melbourne, Australia.

7. Bowden J, Room R, Delfabbro P, Miller C, Wilson C. (2018, May 2-4). Does the presence of children in the home matter when it comes to adult drinking? Paper presented at the *Australian Public Health Prevention Conference.* Sydney, Australia.

APPENDIX B: SAMPLE OF MEDIA GENERATED AS A RESULT OF THIS THESIS[18]

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[18] Please note: this list is in chronological order and is an indicative sample only – it is not an exhaustive list

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APPENDIX C: REPRINT OF ARTICLE PUBLISHED IN 'THE CONVERSATION'

THE CONVERSATION
Academic rigour, journalistic flair

Three ways to help your teenage kids develop a healthier relationship with alcohol

July 20, 2017 11.57am AEST

Parents play an important role in when their teenage children start drinking and their drinking patterns as they grow. from www.shutterstock.com

Lauren, a 15 year old school student, goes to a party at a friend's house where the parents have supplied alcohol. She drinks too much and vomits in the car on the way home.

While this type of story may be common, it's not inevitable. Our new research suggests parents have more of a positive influence on their teenagers' relationship with alcohol than they realise.

What parents say, how they behave and the messages they send to their teenagers can help delay when their teenage kids start drinking, which is critical if they are to avoid the harmful and life-long effects of alcohol on the developing brain.

Parental influences also set the path to better drinking patterns (and reduced rates of alcohol dependence) as their teenage kids grow up.

Why are we so concerned about teenage drinking?

Authors

Jacqueline Bowden
PhD candidate, School of Psychology, University of Adelaide and Manager, Population Health Research, South Australian Health & Medical Research Institute

Robin Room
Professor and Director, Centre for Alcohol Policy Research, La Trobe University

Teenagers' brains are still developing key pathways for memory, learning, judgement and impulse control. So, damage from alcohol misuse at this critical time in development can lead to cognitive issues like memory problems and learning difficulties.

This is one reason Australian guidelines recommend people under 18 avoid drinking alcohol altogether and delay starting for as long as possible.

How big a problem is it?

Out-of-control teenage parties often make the news headlines, so it's easy to think teenage drinking is a growing problem.

But two national surveys have confirmed drinking rates among school students (aged 12-17) and young adults (aged 18-24) are declining.

So, while young people may think drinking is the norm, this is not the case, especially for those under the age of 15 where fewer than 15% report having drunk alcohol in the past month and 8% in the past week.

Nevertheless, alcohol contributes to four of the top five leading causes of death in 15-24 year olds, including suicide, traffic accidents, accidental poisoning and assault. Alcohol in this age group can also lead to sexual risk-taking and is often associated with trying smoking or taking illicit drugs.

It's easy to think our efforts as parents to foster healthier drinking habits in our teenage children is futile. But evidence shows exactly how parents can make a difference. Here are three things you can do to help your teenage kids develop a healthier relationship with alcohol.

1. Limit availability of alcohol

Many parents believe supplying their children with alcohol in the safe environment of their home teaches them to drink responsibly.

In fact, an Australian survey found parents were the most common source of alcohol with 38% of 12-17 year olds who had drunk in the past week indicating their parents gave them their last drink.

Unfortunately, parental supply – whether deliberate or if teenagers drink their parent's supply behind their back – is associated with heavier teen drinking. And a study from the Netherlands found the more adolescents drank at home, the more they were likely to drink outside of the home, which predicted future problem drinking.

Our study also found if adolescents thought they could buy alcohol easily, they were more likely to drink regularly. And the more spending money 16-17 year olds had, the more likely they were to drink.

The weight of the evidence is now clear. Allowing children to drink underage and supplying them with alcohol, including at parties, even under the supervision of a parent, is not recommended.

2. Set boundaries and clear expectations

Parents have a vital role to play in setting boundaries and clear expectations about drinking alcohol. Discuss alcohol with your kids and the fact not everyone drinks, even though it might seem like they do.

Talk about upcoming activities, including parties, and discuss expectations about acceptable and unacceptable behaviour. Talk to other parents and let them know your expectations as it's important to set clear social norms and expectations.

Our study found adolescents who thought their parents would disapprove of them drinking alcohol were much less likely to drink. This was the case across the whole age spectrum of 12-17 years.

3. Be a good role model

Alcohol is the most widely used recreational drug in Australia and most adult drinking (80%) is done in the home. So, we also need to think about our own drinking in front of our children, however uncomfortable the prospect.

Parents are important role models for kids when it comes to alcohol. Setting a good example by limiting drinking in front of kids where possible, not making alcohol and drinking a key focal point, having alcohol-free events and cutting back on your own binge drinking are all significant.

This is important because kids who live in families where parents drink on a regular basis around their children are more likely to drink more heavily themselves and start at an earlier age.

Parents are not the only influence, but are still important

While parents can play a vital role in their children's relationship with alcohol, they are not the only factor to influence teenage drinking.

Alcohol is more affordable in Australia than it has been in the past 30 years, and the number of premises selling alcohol has increased substantially in the past 15 years. Throw advertising and sports sponsorship into the mix and we have some very strong messages that drinking alcohol is the norm.

Yet, the evidence shows parents can make significant and substantial difference in their teenage children's relationship with alcohol, particularly in not giving them alcohol before they turn 18 and helping them set good behavioural patterns around alcohol now and for later life.

Alcohol Teenagers Parenting adolescent health Teens Teenage drinking Teenager Teenage brain