Understanding alcohol use and subsequent harms in young people

An evidence summary

February 2020

health promotion agency
TE HIRINGA HAUORA

Prepared for the Health Promotion Agency/Te Hiringa Hauora (HPA) by: Susan Cook and Lynsey Brown, Senior Researchers

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Any queries regarding this report should be directed to HPA at the following address:

Health Promotion Agency
PO Box 2142
Wellington 6140
New Zealand
www.hpa.org.nz
enquiries@hpa.org.nz

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FOREWORD

Young people's alcohol use: Why should we be concerned?

Despite a recent decrease in youth drinking, over half of young New Zealanders aged 15 to17 drank alcohol in the last year; with 6% drinking at hazardous levels. Young people's drinking is known to increase the risk of poor mental health (including suicide), crime, interpersonal violence, accidents and injury, unsafe sexual behaviour, affected school performance, and breakdowns in social relationships, as well as increasing the risk of future alcohol dependence problems.

Evidence has also found that drinking in adolescence (ie, approximately ages 10 to 24) can have a significant impact on brain development. The brain goes through a substantial period of development during adolescence, making it particularly vulnerable to the effects of alcohol. Alcohol use can negatively impact emotional regulation, memory, learning, and attention.

This evidence review confirms that understanding early drinking behaviour is important, with young people's patterns of drinking continuing into adulthood. This demonstrates that targeting youth drinking can have implications not only for adolescents' development in the short-term, but also long-term health and wellbeing.

What influences young people's drinking?

There are many different and often interacting factors that influence adolescent drinking (Figure 1[1]). At the **individual level**, genetics, age, gender, personality, attitudes, mental health, and adverse childhood experiences (eg, stress, trauma) may impact an adolescent's drinking behaviours. At the **family level**, there are a range of influences from family functioning to living standards, exposure to alcohol and violence, and parenting factors. Parenting factors may include parental attitudes towards alcohol, monitoring of adolescent alcohol use, parental supply of alcohol as well as parental alcohol use, and parent/child relationships. At the **community level**, there are further considerations including deprivation, availability of and access to alcohol, alcohol sponsorship (eg, local sporting clubs), culture, interactions among peers, school environments, and community attitudes and norms.

This evidence review aims to increase our understanding of three key aspects of young people's alcohol use (with a focus on those aged under 18):

- age of first drink
- patterns and trajectories of drinking
- parental supply of alcohol.

The review suggests that age of first drink and parental supply have a role to play in young people's drinking and subsequent harms. The review also highlights the importance of broader individual, parental, and community level factors in influencing youth drinking patterns.

[1] Please note, while displayed separately in the diagram, the relationship between influences and effects is not straightforward, and the factors listed in the blue boxes are likely to continuously affect each other.

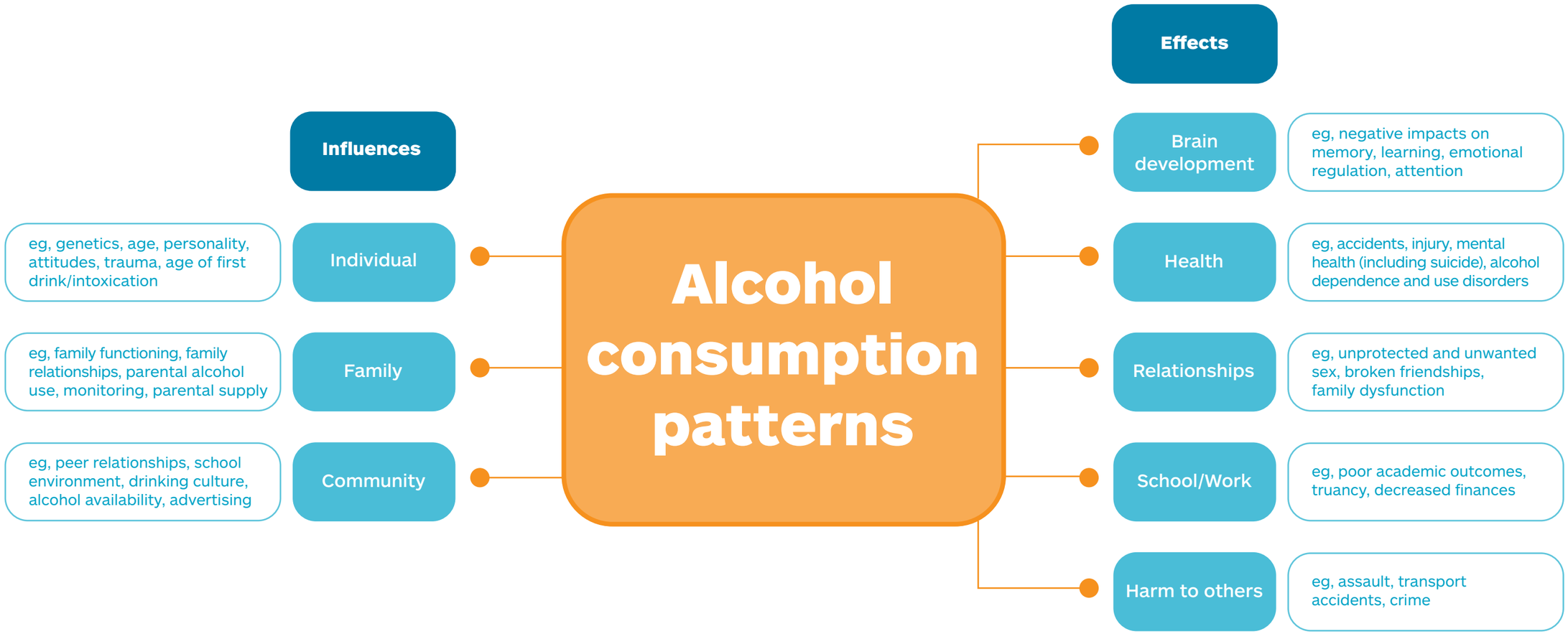

Figure 1: Understanding alcohol use in young people.

What is HPA doing to reduce young people's drinking?

To date, HPA's strategy on reducing adolescent drinking has focused on targeting influencers (including parents); supporting communities to change norms around supply of alcohol; and minimising harm by changing patterns of drinking behaviour among 18 to 24-year-olds already consuming alcohol.

It is also important to focus on wellbeing and the protective factors that help young people to thrive. While there are many factors that contribute to wellbeing, research shows that lifting our levels of belonging, connectedness (including cultural connectedness) and sense of identity are especially important for young people. For example, New Zealand research shows the importance of engagement in Māori culture and family connectedness as being key to higher levels of wellbeing among Māori youth.

We also know that a critical step in decreasing alcohol harm, for young people and more generally, involves developing more positive social norms and supportive environments around alcohol use within our society. This could be achieved by implementing evidence-based policies which strengthen restrictions on alcohol availability, increase the cost of alcohol, and restrict alcohol advertising and sponsorship.[2]

Facilitating health promotion activities that support wellbeing and create healthy social environments will help to reduce a range of health harms, including alcohol consumption.

[2] These policy interventions are recommended as part of the World Health Organization's SAFER Framework.

EXECUTIVE SUMMARY

Young people's alcohol use may affect normal development of brain structure and function, and is associated with injuries, road traffic accidents, unsafe and/or unwanted sex, affected school performance, mental health problems, crime and victimisation (Boden & Fergusson, 2011; Feldstein Ewing, Sakhardande, & Blakemore, 2014; Jackson et al., 2014; Squeglia & Gray, 2016).

The Health Promotion Agency/Te Hiringa Hauora (HPA) reviewed the literature on the relationship between young people's drinking and subsequent alcohol-related harms. The areas of focus are:

i. Age of first drink (AFD)
ii. Patterns and trajectories of drinking
iii. Parental supply of alcohol.

The alcohol-related outcomes of interest (harms) include heavy drinking, self-reported problems, and alcohol use disorders. 'Adolescence' is often defined as ages 10 to 24 (Sawyer, Azzopardi, Wickremarathne, & Patton, 2018) but for the purpose of this review the focus was on the behaviours of those aged 18 and under.

This review aims to improve understanding among those people working to reduce alcohol-related harm in young people. Other factors that contribute to adolescent alcohol consumption and subsequent effects such as those shown in Figure 1 (eg, exposure, availability, access) are not addressed in this paper.

KEY FINDINGS:

- New Zealand studies show that young people's drinking patterns exist on a continuum and that these patterns continue into early adulthood. The continuum includes a majority who 'don't drink or drink at low levels', some that 'drink heavily on occasion', and few that 'drink frequently and heavily'.
- Those who drink at higher levels in adolescence have greater levels of alcohol-related harm in both adolescence and adulthood.
- Factors associated with young people's levels of alcohol consumption include parenting factors (attachment, approval of drinking, monitoring, and parental alcohol use), family and school connection, having peers that drink and/or supply alcohol, individual personality characteristics, attitudes towards alcohol, and experience of adverse events.
- Early AFD is associated with alcohol consumption in adolescence, and may be associated with alcohol-related harms (heavy drinking and self-reported problems) later in adolescence.
- Internal factors such as personality and genetics, and external factors such as family and socio-demographic factors, have more important effects on alcohol-related harms in

adulthood than AFD alone. Recent evidence suggests that age of first intoxication might be a better predictor of harmful early drinking than AFD.

- Parental supply of alcohol is associated with alcohol initiation, alcohol use and misuse, and alcohol-related harms in adolescence. However, on its own, the influence of parental supply is likely to be small.
- There is no convincing evidence that parental supply is protective against later risky drinking, with recent evidence showing that parental supply may be associated with increased supply from other sources (peer and self-supply).

There are a number of implications (related to AFD, patterns of drinking and parental supply) that are relevant for those developing and implementing policies and programmes aimed at reducing alcohol-related harm in young people:

- Recognise that a number of factors predict drinking patterns in young people and so a range of interventions will be required to help them to not drink or reduce their drinking. This may include supporting young people to deal with emotions or distress, establishing healthy social environments around alcohol (including reduced access to alcohol), reducing social supply (ie, parents and friends providing alcohol) and lowering drinking amongst peers and family members.
- Start in early adolescence, and include both delaying AFD and reducing drinking in those that have already had their first drink.
- Consider a whole-person, wellbeing approach that addresses family socio-demographic factors, peer and parental influence, and individual-level factors. This includes supporting parental attachment and good relationships, and developing healthy attitudes and behaviours towards alcohol in parents.
- Support parents to not supply alcohol to their adolescents. Communities have a role to play in supporting parental efforts not to supply alcohol and in changing social norms around alcohol use in adolescence.

Further research is required to improve understanding of:

- How normal brain development is affected by different patterns of drinking and how this might be influenced by other factors.
- Inequities in young people's drinking patterns and alcohol-related harm, and the factors that influence these, particularly in Māori, Pacific, and lower socioeconomic populations.
- The influence of different parenting behaviours and the reasons why, and in what contexts, New Zealand parents supply alcohol to their adolescents.
- The effect of different drinking patterns, including why young people drink at varying levels, why some young people don't drink, and how factors that influence drinking behaviours change over time.

INTRODUCTION

The Health Promotion Agency/Te Hiringa Hauora (HPA) reviewed the literature on the relationship between young people's drinking behaviours and subsequent alcohol-related harms. The areas of focus are:

i. Age of first drink (AFD)

ii. Patterns and trajectories of drinking

iii. Parental supply of alcohol.

The alcohol-related outcomes of interest (harms) include heavy drinking, self-reported problems, and alcohol use disorders. 'Adolescence' is often defined as ages 10 to 24 (Sawyer, Azzopardi, Wickremarathne, & Patton, 2018) but for the purpose of this review the focus was on the behaviours of those aged 18 and under.

This review aims to inform people working to reduce alcohol-related harm in young people. Other factors that contribute to adolescent alcohol consumption and subsequent effects are not addressed in this paper.

Many young people in New Zealand begin to use alcohol while still at school, typically increasing both the amount and frequency of alcohol consumed throughout adolescence. Over half of New Zealand's young people aged 15 to 17 report drinking alcohol in the past year (58%), and 6% report drinking at a level described as 'hazardous'[3] (Ministry of Health, 2019). Alcohol consumption tends to peak in young adults around 21 to 24-years-old, and reduces over the late 20s (Carter, Filoche, & McKenzie, 2017; Casswell, Pledger, & Pratap, 2002; Clark et al., 2013).

Young people's alcohol use is associated with injuries, road traffic accidents, unsafe and/or unwanted sex, affected school performance, mental health problems, and crime and victimisation (Boden & Fergusson, 2011; Jackson et al., 2014). Alcohol use may also adversely affect normal development of the brain structure and function, although the evidence base is still emerging. In particular, the areas of the brain involved in the reward system and in executive control, including response inhibition, and behavioural and emotional self-regulation are likely to be affected (Feldstein Ewing et al., 2014; Squeglia & Gray, 2016). Young people that are heavy and/or occasional heavy episodic drinkers (4/5+ drinks for females/males) have poorer neurocognitive performance on tests of attention, working memory, spatial functioning, verbal and visual memory, and executive functioning (Squeglia, Jacobus, & Tapert, 2014)[4].

[3] Hazardous drinking is defined by the Ministry of Health using the 10-question Alcohol Use Disorders Identification Test (AUDIT). https://minhealthnz.shinyapps.io/nz-health-survey-2017-18-annual-data-explorer/_w_9e66e34b/#!/explore-topics

[4] There is a need for further longitudinal studies to understand whether adolescents that choose to drink at heavy levels have any pre-existing brain differences, prior to initiating alcohol use.

The following three sections look at the link between each of the focus areas (AFD, patterns and trajectories of drinking, and parental supply of alcohol) and alcohol-related harms in adolescence and adulthood. For each focus area, we summarise the current international and New Zealand evidence base. Given the importance of understanding the local context, New Zealand evidence was given greatest weight in the review. All studies were reviewed for quality in terms of study design and sample, potential sources of bias and confounding[5], and criteria for determining causality[6]. A summary of the included studies used to address each of the research questions is provided in Appendix A.

The discussion section then looks at the implications of the evidence base for policy and practice in New Zealand. The strengths and limitations of the current evidence base and current research gaps are also considered.

[5] A confounding factor is something that is associated with both the topic under study (ie, the exposure; for instance AFD) and the alcohol-related outcome (for instance, alcohol use disorders), and is not in the causal pathway between the exposure and the outcome. Confounding factors should be tested, because otherwise you cannot tell if the findings about the relationship between the exposure and the outcome are due, in part, to the presence of this other factor. Different studies generally control for the effect of different confounders, depending on their understanding of the topic and theoretical and methodological approach.

[6] Epidemiological studies routinely use a causality criteria, such as the Bradford Hill Criteria to explore whether there is a cause and effect relationship between a risk factor and an outcome. This criteria considers a number of factors including the strength and consistency of the observed relationship and the biological plausibility of the observed relationship.

AGE OF FIRST DRINK

Background

Interventions that aim to delay a young person's AFD commonly cite evidence that links drinking in adolescence with greater risk of harmful drinking, alcohol abuse and dependence later in adolescence or adulthood as one rationale for action (Donaldson, 2009; National Health and Medical Research Council, 2009; U.S. Department of Health and Human Services, 2007). However, the strength of the evidence for this is unclear (Maimaris & McCambridge, 2014). This review has sought to understand the evidence around the short- and long-term outcomes of an early AFD.

Research questions

1. Does early AFD cause alcohol-related harms in later adolescence?
2. Does early AFD cause alcohol-related harms in adulthood?

Included evidence

To identify whether there may be a causal relationship[7] between early AFD and later outcomes, only prospective, longitudinal studies[8] from general population-based studies[9] were included. Studies were only included where AFD occurred in early adolescence (ie, before 15–years-old) and where both AFD and any reported outcomes were clearly defined. Four studies were identified that measured both AFD and later alcohol-related outcomes in adolescence, and five studies were identified for adult alcohol-related outcomes.

There were differences in how AFD was measured across the studies. This meant different concepts – ranging from "first taste of alcohol" to "first drink in absence of parents" – are likely to have been measured. There were also differences in how confounding factors were measured and accounted for in the analyses. These confounding factors (eg, parental alcohol use) may influence both AFD and alcohol-related outcomes. These differences limit the ability to directly compare findings across the different studies.

In terms of outcomes, an alcohol use disorder (AUD) is identified using the 5th edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM–5). This describes the severity of AUD as mild, moderate, and severe depending on the number of criteria that are met. In the previous DSM-IV, two distinct disorders were described: alcohol abuse and alcohol dependence.

[7] Whether early AFD can be shown to cause, or result in, an outcome (eg, alcohol use disorder), at least in part.

[8] Prospective longitudinal studies are studies that include repeated measures of the same people over time, and where AFD was measured as close as possible to the actual time of exposure. This reduces a major source of bias (retrospective reporting) and ensures the measurement of the exposure (eg, AFD) precedes the measurement of the outcome (ie, makes sense temporally).

[9] Including studies from the general population only means the findings are more likely to be relevant, as opposed to including studies of special populations that are different in a systematic way that matters to the topic (eg, heavy drinking adolescents).

SUMMARY OF THE EVIDENCE

Early age of first drink (AFD) and young people's alcohol consumption

Three studies report that early AFD is significantly associated with alcohol consumption later in adolescence. However, the evidence base is limited by a number of quality and comparability issues. The strongest evidence comes from the high quality Christchurch Health and Development Study (CHDS) birth cohort (Fergusson, Lynskey, & Horwood, 1994) and the Australian Parental Supply of Alcohol Longitudinal Study (APSALS) (Aiken et al., 2018).

The APSALS of students in three Australian states was designed to investigate predictors of initiation and progression of alcohol use while taking into account a wide range of parental, child, familial, peer and contextual factors (Aiken et al., 2017). It found age of initiation ("at least 1 standard drink") was significantly associated with both infrequent and frequent binge drinking (>4 drinks on an occasion) at subsequent measurement waves across five years of adolescence (Aiken et al., 2018).

These results are generally consistent with the findings from the CHDS, where AFD ("first taste of alcohol") showed significant association with later adolescent drinking (frequency, typical amount, and largest amount), although the effects were small.

These studies reported a range of parent and peer influences on both AFD and young adolescent drinking.

Early AFD and alcohol-related harms for young people

Three studies report that early AFD is associated with alcohol-related problems later in adolescence. This was reported by the CHDS study and two studies of lesser quality, which makes this evidence less convincing overall.

In the CHDS cohort there was a significant association between AFD and alcohol-related problems at age 15(Fergusson et al., 1994).

A study of Australian and American adolescents reported drinking before age 13 was found to be associated with alcohol-related problems at age 15, although drinking at age 14 was not (Mason et al., 2011). An American middle school study also reported that alcohol use before age 14 was associated with both alcohol use at 16/17–years-old and alcohol dependence at 19-years-old (Van Ryzin & Dishion, 2014).

Early AFD and alcohol use in adulthood

Our understanding of the relationship between AFD and later alcohol outcomes is limited by the small number of studies. As well, there is a lack of comparability in both measurement of AFD and other influencing factors, and inconsistent findings across studies. This means there is insufficient evidence of a direct causal relationship between AFD and later alcohol-related harms.

Three studies report data from New Zealand birth cohorts and provide the strongest evidence available. Two studies from the CHDS cohort looked at the association between AFD ("first taste of alcohol") and amount of alcohol consumed, number of symptoms of AUD, and AUD in adulthood.

No significant associations were found after a range of family, socioeconomic and psychosocial factors had been taken into account (Newton-Howes & Boden, 2016; Newton-Howes, Cook, Martin, Foulds, & Boden, 2019).

One study from the Dunedin Multidisciplinary Health and Development Study (the Dunedin Study) cohort did find a statistically significant association between early substance exposure, including alcohol exposure ("bought or drank alcoholic drinks"), and adult substance dependence after accounting for a smaller range of other factors (Odgers et al., 2008). However, these findings are not directly comparable to the remaining AFD studies because illicit substances (cannabis, inhalants, and other) were included in both the measures of early exposure and the outcome (of substance dependence).

Two international studies measured AFD and less severe outcomes. A high quality 2013 Norwegian population study found no association between early onset of any drinking (≤ 14 years) and heavy drinking, after taking into account a range of other factors (Rossow & Kuntsche, 2013). One further population study in the USA did find an association between AFD ("consumed more than a sip in the absence of a parent") and heavy drinking (Liang & Chikritzhs, 2015). However, the USA study was limited by greater levels of retrospective AFD data collection, which increases the likelihood of the data being less reliable (Hingson, Zha, & White, 2016; Rossow & Kuntsche, 2013). The study also only took into account a small range of other factors.

Other factors affecting alcohol-related problems in adulthood

The impact of individual personality factors is considered important in influencing alcohol consumption. Conduct problems (Rossow & Kuntsche, 2013), novelty-seeking at age 16 (Newton-Howes & Boden, 2016; Newton-Howes et al., 2019), and neuroticism (Newton-Howes & Boden, 2016) were found to account, at least in part, for the relationship between AFD and later alcohol-related outcomes. This suggests these factors may have a causal role in the development of substance use disorders.

Additionally, the CHDS found average family living standards, exposure to parental intimate partner violence, and childhood sexual abuse influenced the relationship between AFD and later alcohol-related outcomes (Newton-Howes & Boden, 2016; Newton-Howes et al., 2019). Other prospective studies have indicated genetics, puberty, and social factors may also play a role (Blomeyer, Friemel, Buchman, & Banaschewski, 2013; Guttmannova et al., 2012; Irons, Iacono, & Mcgue, 2015; Sartor, Nelson, Lynskey, & Madden, 2013).

Early AFD can occur alongside these other factors. Instead of directly causing alcohol-related harms in adulthood, AFD may act as a marker of these more influential, factors.

Further, it is worthwhile to note that the CHDS analysis also investigated the effects of age of first intoxication (AFI). In contrast to the AFD findings, AFI was found to predict AUD symptoms and AUD even after adjustment for confounding factors (Newton-Howes et al., 2019). This suggests AFI is a stronger predictor of adult alcohol-related harms than AFD, and indicates that drinking patterns in adolescence may be more important to long-term outcomes than AFD alone. More research is needed.

PATTERNS AND TRAJECTORIES OF DRINKING

Background

Studies that group young people based on their different drinking behaviours can provide greater understanding of adolescent drinking patterns (Donovan & Chung, 2015; Muthén & Muthén, 2000). Little is known about the impact of these different drinking patterns on later alcohol-related harms.

This review has sought to describe the different ways that young New Zealanders under the age of 18drink. It also aims to identify risk and protective factors that predict 'membership'[10] to a drinking group, and the alcohol-related harms associated with these groups. Descriptions of drinking behaviours at certain points in time (from cross-sectional data) are referred to as 'patterns' of drinking, and different types of drinking over time (from longitudinal data) are referred to as 'trajectories' of drinking.

Research questions

1. What are the patterns and trajectories of drinking in New Zealand adolescents?
2. What factors predict these patterns and trajectories in adolescence?
3. What alcohol-related harms are associated with different adolescent patterns or trajectories of drinking?

Included evidence

Studies have been included for review where they identify and characterise drinking patterns or trajectories with multiple measures of alcohol use within the under 18-years-old population, and where alcohol-related outcomes in adolescence or adulthood were also reported. Three New Zealand studies were included; one cross-sectional and one longitudinal analysis of the CHDS, and one cross-sectional analysis of the Youth'07 data from secondary school students[11]. Four international studies that measured adolescent patterns or trajectories and subsequent alcohol-related outcomes were reviewed for comparison with the New Zealand data.

[10] These studies create a model that describes groupings of young people in the simplest way. Individuals don't actually 'belong' to a group because these groups cannot be seen in the population and statistical allocation of an individual to a group is probability-based (Nagin & Tremblay, 2005).

[11] The Youth'07 was a nationally representative survey of secondary school students in New Zealand. It was conducted in 2007. The analysis reviewed here was conducted on 5018 students who reported being current drinkers.

SUMMARY OF THE EVIDENCE

Drinking patterns of young people

Two cross-sectional New Zealand studies show a continuum of drinking patterns in young people (Jackson et al., 2014; Wells, Horwood, & Fergusson, 2004), and one New Zealand study shows a continuum of drinking trajectories in young people (Boden, Newton-Howes, Fould, Spittlehouse, & Cook, 2019). The continuum can be thought of as a collection of groups that describe the range of behaviours across all population members (Nagin & Tremblay, 2005; Vachon, Krueger, Irons, Iacono, & Mcgue, 2017). Two of the studies were from the CHDS birth cohort, classifying approximately 953 adolescents at 16-years-old (Wells et al., 2004) and at 14, 15 and 16-years-old (Boden et al., 2019). The third study was a classification of 5,018 secondary school students from the Youth'07 survey (Jackson et al, 2014).

All three studies showed the majority (approximately 70%) of young people drink not at all or at low levels. If drinking, this group drinks infrequently and typically has less than five drinks on one occasion. These adolescents have a low risk of self-reported alcohol-related problems. Only one of the three studies included adolescents of different ages, and this found younger adolescents aged 15 and under were more likely to drink in this way than those aged 16 or 17-years-old (Jackson et al., 2014).

There is also a group of young people drinking at risky levels (about five or more drinks on one occasion) some or much of the time, with drinking frequency varying from less than monthly to up to weekly for some. This group makes up about 20-25% of adolescents under 18-years-old. This pattern of drinking is consistent with the common characterisation of young people as episodic but heavy drinkers[12].

Approximately 8% of teenagers belong to a group where the majority typically drink at least five drinks, and have consumed very high amounts (8+) at least once in the last three months. Many in this group drank weekly, and the majority reported at least one alcohol-related problem. Young people in this group were more likely to report weekly drinking in 2007 (Youth'07 sample) than in 1993 (CHDS cohort), likely reflecting the greater availability of or access to alcohol in 2007. In both the cross-sectional studies, very high alcohol consumption was what differentiated membership between the two highest consumption groups described above. These very high consumption measures were 'largest amount consumed on a single occasion' in the CHDS and 'frequency of binge drinking in the last 4 weeks: 2+ times' in the Youth'07. These may be useful markers for very high risk drinking in young people.

The consistency in findings across the three studies despite differences in sample populations and methods mean they are likely to reflect the true patterns and trajectories seen in contemporary New Zealand young people. Further, the New Zealand findings are generally consistent with

[12] Heavy episodic drinking is a term used to describe drinking 5+ drinks on one occasion in young people. This is also referred to as 'risky' drinking.

international studies (Colder, Campbell, Ruel, Richardson, & Flay, 2002; Danielsson, Wennberg, Tengström, & Romelsjö, 2010; Heron et al., 2012; Toumbourou et al., 2004).

Changes in alcohol consumption of young people

The CHDS trajectory analysis indicates a progression of alcohol use over time for adolescents, even before the age of 16. This is also suggested by the Youth'07 analysis where older students were more likely to be in the heavier consumption groups.

The CHDS trajectory analysis suggests that heavy binge drinking and high frequency/medium quantity drinking may start as early as 16-years-old. One group showed a sharp increase in typical quantity drunk, to approximately >7 drinks on average, at age 15(early high quantity). Another group drank at high frequency from age 14 with a slower increase in typical quantity drunk up to an average of >4 drinks by age 16 (early high frequency) (Boden et al., 2019).

These findings have not been reported before using New Zealand data, but are consistent with other analyses showing a marked progression to heavier alcohol consumption for some adolescents and young adults (Casswell et al., 2002; Shamblen, Ringwalt, Clark, & Hanley, 2014; Toumbourou, Williams, Snow, & White, 2003).

Family, school, peer and individual factors affecting alcohol consumption

The CHDS and Youth'07 studies and a study using data from 18-year-olds in the Dunedin birth cohort study (Casswell et al., 2002) report factors associated with membership to the different drinking groups described above. Overall, the studies showed that those who experience disadvantage in various family, peer, and individual factors are more likely to belong to one of the heavier drinking groups.

Factors associated with greater consumption of alcohol for young people include: heavy parental alcohol use, parental approval of alcohol use, family disadvantage, feeling disconnected from family and/or school, having peers that drink and/or approve of drinking, some personality characteristics, and personal attitudes favourable to alcohol (Boden et al., 2019; Casswell et al., 2002; Jackson et al., 2014). These findings are consistent with international studies of drinking patterns in adolescence (Colder et al., 2002; Danielsson et al., 2010; Heron et al., 2012; Maggs & Schulenberg, 2005).

Targeting action to change these risk factors at a population level may reduce the likelihood of adolescents drinking at higher levels and subsequent harms from drinking.

Young people's drinking and alcohol-related harm in adolescence and adulthood

The studies consistently show that drinking at higher levels in adolescence is associated with greater reporting of harms in adolescence, and greater likelihood of experiencing adverse alcohol-related outcomes in adulthood than drinking at lower levels. An estimated 10 to 15% of young

people under 18-years-old are drinking at levels that promote a number of harms, including risk of serious harms that may affect their school, family, working, and social life[13].

Some studies show that adolescent harms may not increase directly with membership to increasingly greater consumption groups (Colder et al., 2002; Danielsson et al., 2010; Jackson et al., 2014). This may be because adolescents have reduced their drinking (typically measured over the last four weeks) in response to experiencing harms (typically measured over the last 12 months). Drinking in some locations or contexts may also be associated with greater risk of harms than in others, rather than simply drinking frequency or quantity (Jackson et al., 2014).

Only two studies reported on adolescent drinking trajectories and alcohol-related outcomes in adulthood, one of which was the CHDS. Those in the early high quantity or early high frequency trajectories were more likely to meet DSM-IV criteria for AUD and had higher levels of alcohol dependence symptoms at ages 18 to 35-years-old, compared to those in the low consumption trajectory (Boden et al., 2019).

Drinking behaviours

The two CHDS studies indicate that drinking patterns in adolescence extend into young adulthood, with the trajectories analysis suggesting this might extend into mid-adulthood for some. Membership to any of the heavier drinking groups predicts the frequency and amount of alcohol consumed up to age 21. For those in the 'early high frequency' drinking group, membership to this group predicted their drinking trajectory up to 35-years-old (Boden et al., 2019; Wells et al., 2004). This is consistent with other evidence showing adolescent drinking behaviours are associated with levels of consumption in adulthood, including the persistence of heavy episodic drinking into early adulthood (Brunborg, Norström, & Storvoll, 2018; Degenhardt et al., 2013; McCambridge, McAlaney, & Rowe, 2011; Silins et al., 2018).

High frequency drinking

The CHDS trajectory analysis suggests that the frequency of drinking in adolescence may be a greater predictor of harm than the typical quantity drunk. Young people in the 'early high frequency' trajectory reported drinking larger volumes of alcohol in the past 12 months at ages 18 to 35-years-old than those in either the 'low consumption' or 'early high quantity' trajectories. In the top 5% of drinkers in this cohort, 'early high frequency' drinking was associated with AUD up to age 35. This is consistent with findings from other longitudinal cohorts (Silins et al., 2018).

Understanding the influence and impact of drinking frequency versus quantity may have value in health promotion actions.

The effect of drinking patterns

While the evidence consistently shows a positive association between higher levels of drinking in adolescence and greater likelihood of harms in adolescence and adulthood, it does not quantify the

[13] 'Harms' refer to alcohol-related problems. Different definitions were used in the New Zealand studies. For the CHDS cohort, harms included physical, social, and psychological problems. In the Youth'07 study, four types of harms were measured: affected school or work performance, having unsafe/unwanted sex, doing things that could have resulted in serious trouble, and being injured/injuring another person or being in a car crash.

effect of different drinking patterns or trajectories on these outcomes. The evidence to-date is also unable to describe the impact of these in Māori, Pacific, and lower socioeconomic populations, and there is a lack of data on how older teenagers drink (ie, around 17-years-old).

PARENTAL SUPPLY OF ALCOHOL

Background

Parents are a common source of alcohol for young people in New Zealand, with approximately 60% of secondary school students citing 'parents' as a usual source of alcohol[14] (Clark et al., 2013; Health Promotion Agency, 2017). Parents report many reasons for supplying alcohol to their teenagers, including a perception that providing alcohol in the family environment is protective or reduces the likelihood of teenagers experiencing alcohol-related harm (Gilligan & Kypri, 2012; Gilligan, Thompson, Bourke, Kypri, & Stockwell, 2014; Jones, 2016; UMR Research Limited, 2016).

This review has sought to understand the evidence around the short- and long-term outcomes associated with parental supply of alcohol. This includes a focus on how parental supply influences young people's drinking behaviours. It also aims to provide context to these findings and describe why parents supply alcohol.

Research questions

1. Does parental supply of alcohol increase adolescent alcohol consumption or cause alcohol-related harms in later adolescence?

2. Does parental supply of alcohol cause alcohol-related harms in adulthood?

3. What factors influence parents to supply alcohol to their adolescent children?

Included evidence

Results from two systematic reviews and five other studies were used to examine the research questions. Systematic reviews pull together findings from a range of different studies and thus provide a good overview of the evidence about a topic. However, they are limited in their ability to control for the possible influence of wider individual, family, environmental, or peer factors (Yap, Cheong, Zaravinos-Tsakos, Lubman, & Jorm, 2017). The original studies included in the reviews also differed in the characteristics of the adolescents, the definitions of supply, the time over which the parental supply occurs, and the length of follow-up. These limit the ability to compare findings across the different studies.

[14] "Parents buy, give, or let students take from home with permission."

SUMMARY OF THE EVIDENCE

Impact of parental supply of alcohol

The evidence shows a consistent positive relationship between parental supply and initiation of alcohol use, risky drinking and alcohol-related problems in young people. That is, parental supply increases alcohol use in adolescence.

A rigorous systematic review undertaken by Yap et al. (2017) found a “strong and convergent" evidence base that indicates parental supply is associated with adolescent alcohol initiation and later alcohol use and misuse measures. The APSALS supports this finding: parental supply was associated with increased binge drinking and alcohol-related harms compared with no parental supply (Mattick et al., 2018a).

One further systematic review (Sharmin et al., 2017) reported parental supply was associated with adolescent risky drinking (ie, five or more drinks on a single occasion at least monthly). However, this study was of lesser quality than the Yap review based on limitations of the papers included. There were also indications from the CHDS that parental/family supply was weakly associated with higher levels of adolescent drinking, although this study did not account for the influence of other factors (Boden, 2018).

The APSALS reported parental supply was associated with symptoms of AUD but not symptoms of alcohol abuse or dependence (Mattick et al., 2018a)[15]. This is the only study to report on more severe alcohol-related outcomes.

The effect of parental supply on young people’s outcomes is likely to be small overall. The Yap review estimated that parental provision of alcohol explains 4% of the difference in initiation of drinking before age 15, and 7% of the difference in alcohol use or misuse outcomes aged 15+.

However, more evidence is required before conclusions can be drawn about the impact of parental supply on young people’s alcohol-related harms.

The two systematic reviews and the APSALS measured outcomes through late adolescence, but did not measure outcomes through to adulthood. The CHDS analysis showed a weak and limited relationship between the amount of alcohol consumed and AUD symptoms in adulthood (Boden, 2018). More research is required before conclusions can be drawn about the impact of parental supply on adult alcohol-related outcomes.

Parental supply, peer and self-supply

Adolescents access alcohol from various sources, particularly at older ages (Clark et al., 2013; Mattick et al., 2018a). Almost half of the young people in the final wave of data collection in the APSALS (mean age 17.9 years) reported receiving alcohol from both parents and other sources

[15] Symptoms of alcohol abuse and dependence corresponded to the 4th edition of *the Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) and were two distinct disorders. In the modified 5th edition (DSM-V), alcohol use disorder is described instead as mild, moderate and severe, depending on the number of symptoms or criteria that are met.

(Mattick et al., 2018b). This study reported that parental supply in one measurement wave was associated with supply from ‘other’ sources (primarily peer and self-supply) in subsequent waves.

Individuals who received both parental supply and ‘other’ supply had a greater likelihood of binge drinking, alcohol-related harms, and meeting established clinical criteria for alcohol abuse, dependence, and alcohol misuse disorder, than those who reported parental supply only (Mattick et al., 2018a).

The APSALS also suggested that previous parental supply studies may have over-estimated the effect of parental supply (Mattick et al., 2016). Other studies typically measure the presence or absence of parental supply, but do not measure whether the young person is also being supplied by other sources. This may have influenced findings on the effect of parental supply in earlier studies.

Parental influence

A number of parenting factors influence adolescent alcohol consumption, including modelling of alcohol use, attitudes towards adolescent alcohol use, monitoring, and other parent-child relationship factors. Therefore, a range of protective parenting factors or strategies will be required for preventing and/or reducing young people’s alcohol-related harms (Ryan et al., 2011).

Favourable parental attitudes towards alcohol and parental alcohol use have been significantly associated with adolescent drinking behaviour (Rossow, Keating, Felix, & Mccambridge, 2016; Yap et al., 2017). Whereas, the following parental factors were reported to be protective against adolescent drinking and experiences of alcohol related harm (Mattick et al., 2018a; Yap et al., 2017):

- parental monitoring
- parental alcohol-specific rules
- parental religiosity
- parent-child relationship quality
- parental support
- parental involvement.

Because parenting is complex, it is likely that a number of parenting factors interact in a number of ways to influence young people’s behaviour, and may also interact with adolescent and peer factors. Factors such as adolescent externalising behaviours[16] and having peers who use substances have been associated with an increased likelihood of parental supply of alcohol (Mattick et al., 2018b). These young people may also have a greater likelihood of accessing alcohol from other sources.

[16] In the research literature, externalising behaviour describes disruptive/delinquent, hyperactive and aggressive behaviour. It is also termed 'conduct problems' 'antisocial' and 'undercontrolled' (Liu, 2004).

Supply context

The APSALS indicates that young people's drinking may be influenced by whether different amounts of alcohol are supplied, whether the drinking is supervised (by parents) or unsupervised, or other contextual factors. Greater numbers of parents supplied adolescents with alcohol for consumption in family contexts, depending on the age of the adolescent, than in other contexts (Mattick et al., 2018a).

There was no comparison in the APSALS paper of typical quantities of alcohol provided to adolescents by parents versus other sources, but typical quantities supplied by parents generally increased with the young person's age. A New Zealand analysis found more alcohol was supplied by peers (approximately 12 drinks) than parents (approximately five drinks) (Huckle & Romeo, 2018). The levels of harm reported in the APSALS suggests quantities supplied by other sources may be higher than from parental supply.

Other contextual factors likely to affect supply include the age and gender of the adolescent, type of occasion, peers/other people present, alcohol expectancies, frequency and quantity of supply, and location of drinking.

Motivation and context for parental supply

We have a limited understanding of the attitudes, beliefs, and contexts that influence New Zealand parents to supply alcohol to their adolescents. There is limited research on parental awareness and knowledge about harms associated with young people drinking alcohol. There is also limited understanding of the role and influence of social norms in families, peer groups, or communities, and of the role of parental supply in reinforcing those norms.

Evidence from one literature review (Jones, 2016) and two New Zealand studies (Kypri, Dean, & Stojanovski, 2007; UMR Research Limited, 2016) indicates that perceived social norms of other adolescents, other parents, and the wider community have a strong influence over parental decisions whether to supply alcohol or not. Parents report conflicted attitudes to supplying their children and teenagers with alcohol; but, in general, many parents agree that supplying alcohol is acceptable.

Parents say they supply alcohol to their adolescent children as a way to exert some control and teach them how to drink responsibly, in order to reduce potential harms. An essential part of this control is setting limits on the types, amounts, and settings in which the adolescent may drink.

Other factors influencing supply include the belief that drinking in adolescence is almost inevitable, the widespread use of alcohol in family and community contexts, and the age and gender of the adolescent. Parents in a New Zealand study said they needed assistance and support in order to not supply alcohol to their adolescents, given the influence of external factors on alcohol-related behaviour (UMR Research Limited, 2016).

Measuring parental supply

There are several measurement issues that limit our understanding of the effect of parental supply of alcohol. The evidence largely consists of studies that have not accounted for the effect of other

sources of alcohol. In addition, the way parental supply was defined in the studies means that the effects of supplying sips of drinks and supplying one or more drinks are likely to have been combined. However, these are two separate behaviours (Wadolowski et al., 2015), and the relationship between supply and outcomes may differ depending on the amount of alcohol supplied.

Adolescents and parents also report different levels of parental supply, with parents more likely to under-estimate levels of supply (Kypri, Dean, Kirby, Harris, & Kake, 2005). Some of the original studies included in the systematic reviews used parental reports of alcohol supply.

Finally, although the APSALS was of high quality, it was conducted on a sample that under-represented people from lower socioeconomic groups, and has not been replicated in a population similar to New Zealand. The studies included in the Yap systematic review were conducted in groups from Western Europe, North America, and Australia. Therefore, the results may not be as relevant to the New Zealand population.

DISCUSSION

This review of the evidence has shown that a number of complex and interrelated factors are associated with young people's drinking behaviours and subsequent outcomes. The evidence for a causative effect of early AFD on both adolescent and adult outcomes is inconsistent and of variable quality. An early AFD may influence young people's drinking behaviours, but there is no convincing evidence that a policy of delaying AFD will directly prevent or reduce adult alcohol-related harms.

However, heavier adolescent drinking patterns or trajectories are associated with greater risk of physical, social and psychological harms in adolescence. They are also associated with a greater likelihood of higher alcohol consumption, alcohol use disorders, and alcohol dependence in adulthood. Even by the age of 15 or 16, up to 10 to 15% of adolescents may be experiencing alcohol-related harms.

This paper has demonstrated that there is sufficient evidence of adverse short- and long-term effects of adolescent drinking to support action that will promote non-drinking in adolescence. The rapid social, psychological, biological, and neurological developmental changes during adolescence mean that it is both a critical time and a time of great potential for intervention (Viner et al., 2015; Windle, 2016; Yap et al., 2017). Adolescent alcohol-related behaviour is influenced by parenting practices and family environment, adverse life experiences, connections to family and peers, and their attitudes and behaviours around alcohol, individual characteristics, and community expectations.

These literature reviews specifically investigated evidence that was relevant to the New Zealand adolescent population. This was possible mainly because of the availability of high quality longitudinal data from the CHDS, other general population New Zealand studies, and some good quality longitudinal studies from Australia. Because drinking behaviours are influenced by local policy and legislation, and drinking cultures and social norms, the importance of New Zealand data must be emphasised. Good quality Australian studies were also considered important because of the similar drinking cultures and context to New Zealand.

Policy and practical implications

There are a number of implications (related to AFD, patterns of adolescent drinking and parental supply) that are relevant for those developing and implementing policies and programmes aimed at reducing alcohol-related harm in young people:

- A number of factors predict drinking patterns or trajectories. These are different for different adolescents and can change throughout adolescence. A range of interventions will be required for those at different ages or life stages.
- Supporting under 18s not to drink is important in order to prevent and minimise potential harms from alcohol consumption in adolescence. Delaying AFD should be considered one

approach within a number of approaches, including preventing or reducing drinking and delaying AFI in those that have already had their first drink.

- Approaches to reducing alcohol-related harm need to start in early adolescence, as some are already drinking heavily by ages 15, 16 and 17. Approaches need to account for different age and drinking-stage needs.
- A whole-person, wellbeing approach that addresses family socio-demographic factors, peer and parental influence, and individual-level factors may be effective at reducing alcohol consumption and associated harms at a population level.
- Some drinking patterns are more harmful than others, and young people that display early heavy or frequent drinking may need targeted approaches.
- There is a need to raise awareness among parents that supplying alcohol to teenagers is not protective, but is in fact associated with greater risk of alcohol misuse or alcohol-related harms during adolescence.
- New Zealand parents need assistance and support in order to not supply alcohol to adolescents. Communities have a role to play in supporting parental efforts not to supply alcohol, and other activities aimed at preventing or reducing young people's drinking.
- Actions that support positive alcohol-specific parenting behaviours may help delay AFD or reduce alcohol consumption in young people. These include developing healthy parental attitudes and behaviours towards alcohol, limiting provision and access to alcohol, and monitoring adolescents' daily activities.

Research implications

This review has identified a number of gaps in our knowledge. Overall, greater understanding is required about the role and impact of alcohol use and supply in Māori, Pacific, and lower socioeconomic adolescent populations, and in contemporary New Zealand drinking cultures.

The evidence to-date is unable to quantify the impact of drinking patterns and trajectories on later alcohol-related outcomes with certainty, and is unable to describe the impact of these in Māori, Pacific, and lower socioeconomic populations.

Further work is required to understand why young people drink at varying levels, and why some young people do not drink, how these change over adolescence, and what interventions may be effective at different ages and stages. These factors include the role of individual and genetic factors; family, peer and other social influences; and attitudes and expectancies towards drinking. Understanding which alcohol-related and contextual factors result in adolescent alcohol-related harms is also needed.

Parental supply is a major factor in forming norms and expectations around drinking for young people, and directly increases access to alcohol. Research is required to understand why New Zealand parents supply alcohol to their adolescents, and how the age and gender of the

adolescent and the context in which supply occurs influences these decisions. The role of peer supply, and how it interacts with parental supply, is also not well understood.

The literature also provides some lessons in terms of conducting specific studies about these topics. Measuring AFI, frequency of drinking, or single highest occasion may be useful single indicators of current or future harm. Studies measuring parental supply should use definitions that are meaningful for both parents and young people, and should ensure peer and other supply of alcohol is also taken into account.

STRENGTHS AND LIMITATIONS

The ability to make causal inferences based on the evidence is limited by several factors. The body of evidence for each topic is limited by differences in terms of the sample characteristics and focus of the original research studies. This includes different measurement approaches that, for the AFD and parental supply evidence, meant slightly different concepts were measured across different studies. Each of the studies also differ in how potential confounding factors were defined and measured.

Further, although only prospective studies were included for review, there was still some retrospective reporting[17] in the original studies because of the timing of data collection. These limitations mean that the original studies in each literature review are often not directly comparable, and reduces the ability to interpret findings with any certainty.

However, this review took several steps to minimise these possible sources of bias and ensure only high quality studies were included. Peer-reviewed studies were included where they measured the usual general adolescent population, were prospective and longitudinal, measured clearly defined outcomes and considered possible confounding factors, and had low attrition rates[18].

The evidence demonstrated largely consistent findings for some of the research questions, in terms of both the direction of association and the consistency across different populations in different places and times. The findings were also both temporally and theoretically plausible. These factors mean that, despite the limitations, our ability to draw conclusions from the body of evidence is strengthened.

In each of the three topics, data from the CHDS was given additional weight because of the longitudinal nature of the study, repeated annual measurements during childhood and adolescence up to age 17, high retention rate, and it being a source of New Zealand data. However, it must be noted that this cohort were adolescents in the early 1990s, and the findings may not be as relevant to young New Zealanders in contemporary social and drinking cultures. Further, the CHDS data dominate some findings because there were few other relevant studies in some topics to review. The evidence would be strengthened if similar findings were reported in other studies.

As in all literature reviews, it is possible that some relevant published papers were not identified. It is also possible that publication bias – where papers that report either no effect or protective effects of adolescent drinking on later outcomes are not published – may have influenced what studies were available to review.

[17] Recall bias related to retrospective self-reporting of alcohol consumption or other behaviours may result in under- or over-estimations of effects.

[18] Attrition from the original sample is a source of bias because those participants who drop out of studies may be different in terms of alcohol-related behaviours than those who stay in the study. In alcohol research, those who drop out are more likely to be at higher risk of alcohol-related harm.

Finally, it should be noted that this literature review did not cover all aspects of alcohol consumption and behaviour in adolescents. The topics covered in this review were selected in order to fill some of the gaps in knowledge that may be relevant to those working to reduce alcohol-related harms in young people. This paper does not attempt to offer a complete understanding of all factors involved in adolescent alcohol consumption and subsequent effects. This review has also focused on alcohol-related outcomes, although alcohol consumption in adolescence is also associated with other health, social, and psychological outcomes.

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APPENDIX A STUDIES ADDRESSING EACH OF THE RESEARCH QUESTIONS

Age of first drink (AFD) and alcohol-related outcomes

Research question:	Addressed by:
(1) Does early AFD cause alcohol-related harms in later adolescence?	Age of alcohol initiation and progression to binge drinking in adolescence: A prospective cohort study (Aiken et al., 2018). Childhood exposure to alcohol and adolescent drinking patterns (Fergusson et al., 1994). Early-age alcohol use and later alcohol problems in adolescents: Individual and peer mediators in a bi-national study (Mason et al., 2011). Adolescent deviant peer clustering as an amplifying mechanism underlying the progression from early substance use to late adolescent (Van Ryzin & Dishion, 2014).
(2) Does early AFD cause alcohol-related harms in adulthood?	Relation between age of first drinking and mental health and alcohol and drug disorders in adulthood: Evidence from a 35-year cohort study (Newton-Howes & Boden, 2016). Comparison of age of first drink and age of first intoxication as predictors of substance use and mental health problems in adulthood (Newton-Howes et al., 2019). Is it important to prevent early exposure to drugs and alcohol among adolescents? (Odgers et al., 2008). Early onset of drinking and risk of heavy drinking in young adulthood – A 13 year prospective study (Rossow & Kuntsche, 2013). Age at first use of alcohol predicts the risk of heavy alcohol use in early adulthood: A longitudinal study in the United States (Liang & Chikritzhs, 2015).

Drinking patterns and trajectories and alcohol-related outcomes

Research question:	Addressed by:
(1) What are the patterns and trajectories of drinking in New Zealand adolescents?	Drinking patterns in mid-adolescence and psychosocial outcomes in late adolescence and early adulthood (Wells et al., 2004). Predictors of drinking patterns in adolescence: A latent class analysis (Jackson et al., 2014). Trajectories of alcohol problems based on early adolescent alcohol use: Findings from a 35 year population cohort (Boden et al., 2019).
(2) What factors predict these patterns and trajectories in adolescence?	Predictors of drinking patterns in adolescence: A latent class analysis (Jackson et al., 2014). Trajectories of alcohol problems based on early adolescent alcohol use: Findings from a 35 year population cohort (Boden et al., 2019). Trajectories of drinking from 18 to 26 years: Identification and prediction (Casswell et al., 2002).
(3) What alcohol-related harms are associated with different adolescent patterns or trajectories of drinking?	**In adolescents** Drinking patterns in mid-adolescence and psychosocial outcomes in late adolescence and early adulthood (Wells et al., 2004).

	Predictors of drinking patterns in adolescence: A latent class analysis (Jackson et al., 2014). A finite mixture model of growth trajectories of adolescent alcohol use: Predictors and consequences (Colder, Campbell, Ruel, Richardson, & Flay, 2002). Adolescent alcohol use trajectories: Predictors and subsequent problems (Danielsson et al., 2010). Patterns of alcohol use in early adolescence predict problem use at age 16 (Heron et al., 2012). **In adults** Drinking patterns in mid-adolescence and psychosocial outcomes in late adolescence and early adulthood (Wells et al., 2004). Trajectories of alcohol problems based on early adolescent alcohol use: Findings from a 35 year population cohort (Boden et al., 2019). Prediction of alcohol-related harm from controlled drinking strategies and alcohol consumption (Toumbourou et al., 2004).

Parental supply of alcohol to adolescents and alcohol-related outcomes

Research question:	**Addressed by:**
(1) Does parental supply of alcohol increase adolescent alcohol consumption or cause alcohol-related harms in later adolescence?	Modifiable parenting factors associated with adolescent alcohol misuse: A systematic review and meta-analysis of longitudinal studies (Yap et al., 2017). Parental supply of alcohol in childhood and risky drinking in adolescence: A systematic review and meta-analysis (Sharmin et al., 2017). Association of parental supply of alcohol with adolescent drinking, alcohol-related harms, and alcohol use disorder symptoms: A prospective cohort study (Mattick et al., 2018a). Associations between parental/family supply of alcohol and adolescent alcohol-related outcomes (Boden, 2018).
(2) Does parental supply of alcohol cause alcohol-related harms in adulthood?	Modifiable parenting factors associated with adolescent alcohol misuse: A systematic review and meta-analysis of longitudinal studies (Yap et al., 2017). Associations between parental/family supply of alcohol and adult alcohol-related outcomes (Boden, 2018).
(3) What factors influence parents to supply alcohol to their adolescent?	Parental provision of alcohol: A TPB-framed review of the literature (Jones, 2016). Parental supply of alcohol to under 18s (UMR Research Limited, 2016). Parent attitudes on the supply of alcohol to minors (Kypri et al., 2007).