Draft Australian Guidelines to Reduce Health Risks from Drinking Alcohol
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1. Plain English summary

These guidelines have been produced by the National Health and Medical Research Council (NHMRC) to inform Australians of the health risks of drinking alcohol and to provide recommendations to reduce these risks to a low level. This will help people make informed decisions about how much alcohol they choose to drink.

The guidelines are based on a thorough evaluation of the evidence. Their development was guided by an independent expert committee with expertise including clinical and public health, alcohol policy, alcohol research, consumer advocacy, epidemiology and biostatistics. Details about how each guideline was developed are included in the ‘Rationale’ and ‘Scientific evidence’ sections within each guideline.

The general aim of these recommendations is to keep alcohol consumption below a level of risk that is seen as acceptable for those that drink alcohol, based on what the evidence says about the effects of drinking alcohol. It also recognises that on average, Australians who drink alcohol are estimated to consume alcohol about three times per week.

Guideline One:

To reduce the risk of harm from alcohol-related disease or injury for healthy men and women, drink no more than 10 standard drinks per week and no more than 4 standard drinks on any one day.

The less you choose to drink, the lower your risk of alcohol-related harm. For some people not drinking at all is the safest option.

Guideline One is supported by a review of the evidence and mathematical modelling that provided information on the lifetime risk of dying from alcohol-related disease and injury based on different levels and patterns of drinking. The modelling showed that for both men and women, the lifetime risk of dying from alcohol-related disease or injury remains below a level of 1 in 100 (see Section 4 Understanding risk) if no more than 10 standard drinks are consumed each week and no more than 4 standard drinks are consumed on any one day. Drinking above this level increases this risk while drinking less frequently and drinking less on each occasion reduces this lifetime risk of alcohol-related harm.

The body of evidence that supports this recommendation now shows:

• Greater certainty about the link between alcohol consumption and the risk of developing a number of different cancers.

• Increased uncertainty about any protective benefits of drinking alcohol.

• Similarity in the overall risk of alcohol-related harm between women and men at low levels of alcohol consumption (for example fewer than 10 drinks a week).

In some situations, not drinking is the safest option, including when:

• Taking part in activities that require attention, mental and physical skills, and concentration to ensure safety (e.g. driving, water activities, snow sports, flying an aircraft or operating heavy machinery).

• Supervising others who are taking part in such activities.

• Supervising children.
Guideline One applies to healthy adult men and women. Some people, however, may have an increased risk of harm if they drink alcohol. These include:

- Young adults aged 18–25 years, who are likely to be at increased risk of alcohol-related harm, particularly injury. In addition to following Guideline One, young adults are encouraged to take steps to minimise their risk of injury and other harms in relation to alcohol.
- Young people under the age of 18 (see Guideline Two).
- Pregnant and breastfeeding women (see Guideline Three).
- People aged over 60 years, who are at increased risk of alcohol-related harm due to age-related changes to their body composition (e.g. reduced muscle mass) and their ability to process alcohol. Older people are also more likely to have health problems and/or be taking medications that can interact with alcohol. Older people are advised to consult their health professional about the most appropriate level of drinking for their health.
- People with a family history of alcohol dependence, who are at greater risk of developing problematic patterns of drinking than the general population. Anyone with a close relative with alcohol dependence should consider discussing their alcohol intake with a health professional.
- People who use illicit drugs or misuse prescribed medicines. Combining illicit drugs or prescription medicines with alcohol can have dangerous or lethal consequences. People who use illicit drugs or misuse prescribed medicines are encouraged to take steps to minimise these risks.
- People taking medications. Alcohol may interact with prescription or over-the-counter medications to increase adverse effects or reduce the effectiveness of the medication. People taking medications (including herbal preparations) should check with their doctor or pharmacist for possible harmful interactions between their medications and alcohol; giving up alcohol may be necessary, particularly for people taking multiple medications.
- People with alcohol-related conditions or other physical or mental health conditions should discuss their alcohol intake with a health professional.

Guideline Two:

To reduce the risk of injury and other harms to health, children and young people under 18 years of age should not drink alcohol.

There is no ‘safe’ or ‘no-risk’ level of drinking alcohol for children and young people aged under 18 years. This is because alcohol can harm the way the body and brain develop, increase the risk of injury and other immediate harms, and increase the risk of developing alcohol-related conditions later in life.

Guideline Two is based on evidence that higher levels of drinking in young people increase the risk of immediate harm, including injuries and alcohol poisoning. Evidence also suggests beginning drinking alcohol at an early age increases the risk of later physical and mental health conditions, including alcohol dependence. Studies show that the later young people delay their first alcoholic drink the less likely they are to develop an alcohol use disorder.

Young people are at increased risk of the harmful effects of alcohol because of their developing brain, a smaller lean muscle mass (for some), and inexperience with the effects of drinking. When this is combined with a greater likelihood of risk-taking behaviour, young people are at greater risk of physical injury, including through alcohol poisoning, self-harm and unsafe sexual behaviour. The evidence suggests that adolescent drinking to intoxication is also associated with reduced cognitive performance and increased risk of mental health problems and suicidal behaviours.
Guideline Three:

To reduce the risk of harm to their unborn child, women who are pregnant or planning a pregnancy should not drink alcohol.

For women who are breastfeeding, not drinking is safest for their baby.

Guideline Three is based on evidence of potential harm to the developing fetus or infant when a mother drinks alcohol while pregnant or breastfeeding. There is not enough evidence to recommend a safe amount of alcohol that pregnant women and breastfeeding mothers can drink. Therefore, these guidelines take a precautionary approach and recommend not drinking at all when pregnant or breastfeeding.

The evidence indicates that the risk of harm to the fetus increases the more alcohol the mother consumes and the more frequently she drinks. It also indicates that alcohol exposure throughout pregnancy (including before pregnancy is confirmed) can have consequences for the developing fetus.

This does not mean the fetus will always be harmed. However, while the risk of harm to the fetus is likely to be slight when the mother drinks small amounts of alcohol (less than 1 standard drink per day), there is not enough evidence to know for sure whether the fetus will be safe from harm, even at this low amount of alcohol.

A variety of maternal and fetal factors can play a role in determining the risks from drinking alcohol while pregnant. This makes it hard to predict the level of risk in any one individual pregnancy.

When a breastfeeding woman drinks alcohol, the alcohol passes into the breastmilk and may affect the baby’s sleep and ability to feed. For these reasons, the guidelines recommend that for breastfeeding women not drinking alcohol is safest for their baby.
2. Introduction

Alcohol is the most widely used drug in Australia, with approximately 80% of adults drinking alcohol each year (Australian Institute of Health and Welfare 2017). People drink alcohol for a wide range of reasons and in different social and cultural contexts.

Alcohol consumption is linked with increased risk of injury, chronic disease and premature death. Moreover, excessive intake of alcohol not only affects the drinker’s health but can have effects on other members of the community (Callinan and Livingston 2019).

Aim

These revised guidelines provide accurate and contemporary information about the health risks related to drinking alcohol and aim to help Australians make healthy choices about their drinking. The information presented in these guidelines is the result of:

• Thoroughly reviewing the latest and best available evidence.
• Considering the quality of the evidence and interpreting its importance.
• Making the reasons for the recommendations as transparent as possible.

Scope of the guidelines

The aim of these Australian Guidelines to Reduce Health Risks from Drinking Alcohol is to provide clear guidance for Australians on reducing their risk of harm from drinking alcohol. They are also intended to form the evidence base for future policy making and educational materials.

The guidelines focus on reducing health risks from drinking. They evaluate the extent of risk posed by alcohol at different levels of consumption and summarise the evidence on how different levels and frequencies of drinking are likely to impact on different aspects of health.

The following are not included as they are beyond the scope:

• Detailed information about the economic and social effects of alcohol consumption.
• Recommendations about legal or other regulatory processes associated with alcohol.
• Detailed recommendations in relation to specific health conditions.
• Standards of conduct associated with buying, selling and serving alcohol.
• The role of health services, including general practice, in assessment of alcohol related issues, referral and treatment.

As detailed recommendations relating to specific health conditions are beyond the scope of these guidelines, specialist professional organisations and societies are encouraged to develop additional guidance to meet such needs.

The Commonwealth Department of Health is responsible for implementing these guidelines and will develop a range of resources designed to reach individuals and communities.
Target audience

These guidelines apply to all Australians including those who are considering drinking alcohol, those who do drink alcohol and parents of young people who may be considering starting to drink. They provide useful information about the risks involved when alcohol is consumed at different levels and frequencies. The guidelines are intended as a resource for individuals, organisations and agencies who influence Australians’ attitudes towards alcohol and drinking, including policy and decision-makers, planners, health professionals, parents and family members, educators, industry organisations and those responsible for serving alcohol. The guidelines include a plain English summary to assist the general public in understanding the risks of alcohol-related harm and to support informed decision-making based on this advice.

How the guidelines were developed

NHMRC has published evidence-based guidelines to help Australians reduce the risk of harm associated with drinking alcohol since 1987. The previous edition, Australian Guidelines to reduce health risks from drinking alcohol, was published by NHMRC in 2009 (National Health and Medical Research Council 2009). Research on the health effects of alcohol is continuously evolving and new studies are published regularly. For this reason, NHMRC reviews its guidelines to ensure that the advice is up to date and reflects the latest body of evidence.

The Council of NHMRC, in consultation with the Department of Health, directed a revision of the guidelines in 2015. An independent Expert Committee made up of members with expertise in clinical and public health, alcohol policy, alcohol research, consumer advocacy, epidemiology and biostatistics (see Appendix 2 for Terms of Reference and membership) was appointed (the NHMRC Alcohol Working Committee) to guide this revision.

The NHMRC 2009 Alcohol Guidelines took a novel approach to reporting on the health risks of drinking, providing new information about the risks of alcohol-related harm over a lifetime. Specifically, the 2009 guidelines conveyed to the Australian public and policy makers a new concept of the risk of harm progressively increasing as the amount of alcohol consumed increases. In these revised guidelines, NHMRC has retained this approach but simplifies the messages further by separating the guidelines into three distinct categories: healthy adults, children and young people, and pregnant or breastfeeding women.

An internationally recognised approach was used to synthesise the evidence and translate this into guideline recommendations and accompanying text. This approach - GRADE (Grading of Recommendations Assessment, Development and Evaluation) is described further in Appendix 2 Administrative Report. In developing the recommendations, quality evidence from a range of sources was considered as detailed below.

NHMRC is increasingly developing ‘living’ guidelines, using methods that enable elements or modules of a guideline to be updated as the evidence changes to ensure guidelines are current, relevant and responsive to emerging evidence. For this guideline, NHMRC has presented the recommendations and other information in the MAGICapp platform to allow for a ‘living’ guideline, one where NHMRC can update any part of the guideline should the relevant body of evidence change.
The evidence base for the guidelines

These guidelines were informed by:

1. An evidence evaluation of 38 systematic reviews that assessed short- and longer-term health risks and benefits of varying levels and/or patterns of alcohol consumption.

2. Four additional systematic reviews on the specific health effects of drinking alcohol on mental health, long-term mild cognitive impairment, and on the fetuses, babies and children of women drinking alcohol while pregnant or breastfeeding.

3. Mathematical modelling of the health risks associated with varying levels and patterns of alcohol consumption.

4. The 2009 guidelines, where the evidence underpinning this advice was deemed to be still current.

5. Data from the most recent surveys and reports such as the 2016 National Drug Strategy Household Survey.

6. Additional publications accepted after the initial evidence evaluation (described below).

Capturing new evidence

Evidence on the health effects of alcohol is evolving continually. To ensure inclusion of important evidence published after the initial evidence evaluation was conducted, the public had a chance to provide publications of interest, as did members of the Expert Committee. Two additional approaches were used to contribute to the evidence base of this revised guideline.

Firstly, NHMRC conducted a public call for evidence between 25 November 2016 and 13 January 2017 to capture relevant studies and issues of public concern. To be considered, publications had to meet certain quality criteria:

- High quality studies (systematic reviews, randomised controlled trials and observational studies including cohort, case-control or nested case control studies).
- Published after the search of the literature for the Evidence Evaluation Report was conducted.
- Evidence that assessed the health effects of varying levels and/or patterns of alcohol consumption (alcohol only, not in combination with other drugs) that was generalisable to the Australian population.
- Publically available and published in the English language in peer reviewed journals.

Secondly, NHMRC accepted other high-quality articles and reports published since 2009. These had to meet similar quality criteria to the above public call for evidence.

Evidence from both of these activities was not formally evaluated, and as such did not inform the guideline recommendations. Rather, it was used to further support and update the information in other sections of the guidelines.

A summary of the evidence used to develop each recommendation and the accompanying information is included in each of the guideline chapters.

An overview of the guideline development process, including the methods for the evidence evaluation, systematic reviews and modelling, is presented in Appendix 2 Administrative Report. The reports on all of the evidence activities are on the NHMRC website for these guidelines.
How the evidence was used

The structure and final wording of the three public health recommendations were based on the evidence evaluation, systematic reviews and the mathematical modelling. The Committee used GRADE, and its Evidence to Decision Framework to finalise the recommendations. Other evidence sources as described above were used to develop the narrative text of the guideline that supports the key recommendations.

Public health evidence

For clinical practice guidelines, randomised controlled trials provide the highest level of evidence on the health effects of a particular intervention; however, in public health, there are many situations where randomised controlled trials are not practical or are unethical. For example, it is not ethical to randomise one group to be exposed to cigarette smoke for three years and another to not be exposed, then test the health outcomes of both groups 10 years later.

As a result, a large amount of evidence for public health guidelines, including those relating to alcohol, comes from long-term observational studies. This does not mean that the quality of evidence is insufficient to provide advice to Australians on the health effects of drinking alcohol; instead, the evidence used is the most appropriate for such a public health issue. Each guideline describes the evidence base that underpins the recommendation and the supporting guideline text.

The guideline format

The format of each recommendation and its associated chapter includes:

• The public health recommendation: central advice based on the key evidence sources.
• Evidence base: describes the evidence sources used for that guideline.
• Other sections: discussion of what the evidence reports on the relevant outcomes.

MAGICapp tabs

• Key Information: captures key information of the ‘evidence to decision framework’, including the quality of and confidence in the evidence, harms and benefits of exposure (drinking alcohol at varying levels and patterns), values and preferences of the target population, impact of the recommendation on health equity, resource implications, feasibility and acceptability of the recommendation and other considerations.
• Rationale: provides overarching justification for the stated advice.
• Practical information: provides practical information and further advice that may facilitate the guideline being used to improve the formulation of policy and the delivery of services.
3. Background: Alcohol drinking in Australia

Burden of disease

Alcohol is the sixth highest risk factor for burden of disease in Australia; in 2015 alcohol was responsible for 4.5% of the total burden of disease and injury (Australian Institute of Health and Welfare 2019). There are marked gender differences; among women, 2.8% of the disease burden is attributable to alcohol compared with 6.0% of the disease burden among men (Australian Institute of Health and Welfare 2019).

In 2015, alcohol was responsible for 22.4% of the burden due to road traffic injuries, 28.0% of the burden due to chronic liver disease, 40.2% of the burden due to liver cancer, 14.3% of the burden due to suicide and self-inflicted injuries, 14.1% of the burden due to homicide and violence, and 11.0% of the burden due to drowning (Australian Institute of Health and Welfare 2019).

In 2016, the prevalence of alcohol use disorder in Australia (including harmful use of alcohol and alcohol dependence) was estimated at 4.4% (6.1% in males; 2.7% in females) (World Health Organisation 2014). Alcohol consumption has been causally linked to more than 60 medical conditions (Bowden, Delfabbro et al. 2014). In 2017, there were 1,366 alcohol-induced deaths (directly attributable to alcohol) and another 2,820 alcohol-related deaths where alcohol was mentioned as a contributory cause of death (Australian Bureau of Statistics 2018). Between 1 July 2016 and 30 June 2017, alcohol accounted for 70,011 hospital separations (episodes of care) and for 51% of all drug-related hospital separations (Australian Institute of Health and Welfare 2018).

Current alcohol consumption: patterns and trends in Australia

Drinking alcohol is common in Australia. The 2016 National Drug Strategy Household Survey (NDSHS) reported that 77.5% of Australians aged 14 years and older consumed alcohol in the previous 12 months (Australian Institute of Health and Welfare 2017). A small proportion of people aged 14 or older drank daily (5.9%), about one third drank weekly (35.8%), the same proportion (35.8%) drank less than weekly and 14.5% reported having never consumed a full serve of alcohol.

While most Australians consume alcohol, they generally drink at levels within the NHMRC’s 2009 Alcohol Guidelines, which aim to keep the risk of alcohol-related harm low. However, some people drink at levels above these recommendations and so increase their risk of alcohol-related disease and injury.

In 2016, 17.1% of Australians (aged 14 years and older) exceeded the NHMRC’s 2009 lifetime risk guideline by consuming more than 2 standard drinks per day and 25.5% of Australians exceeded the single occasion of drinking guideline by consuming more than four standard drinks on a single drinking occasion at least once a month (Figure 3.1) (Australian Institute of Health and Welfare 2017). Those who exceeded the lifetime risk guideline were most likely to be aged between 40–49 years (20.6%) and 50–59 years (20.4%). While those most likely to exceed the single occasion risk guideline at least once a month were aged between 18–24 years (42%) (Australian Institute of Health and Welfare 2017).
Between 2013 and 2016, the proportion of people exceeding the lifetime risk guideline declined (18.2% to 17.1% respectively) but the proportion of people exceeding the single occasion risk guideline remained stable (approximately 26%) (Australian Institute of Health and Welfare 2017).

![Figure 3.1. Proportion of Australians exceeding lifetime and single occasion risk guidelines 2016](image)

Notes
Lifetime risk: On average, had more than 2 standard drinks per day
Single occasion risk: Had more than 4 standard drinks at least once a month

Over time there have been significant shifts in patterns of drinking, suggesting that Australians’ attitudes towards drinking may be changing. The 2016 NDSHS found that Australians are drinking less frequently. The proportion of people drinking daily or weekly declined, while those drinking less often increased. The proportion of people who have never had a full glass of alcohol has also increased (Figure 3.2) (Australian Institute of Health and Welfare 2017). Analysis of drinking patterns from the NDSHS shows that, on average, Australians consume alcohol 3 days per week (see Appendix 1: Drinking frequency). The NDSHS survey reported almost half (48%) of recent drinkers (defined as those who drank at least one serve of alcohol in the last 12 months) had taken action to reduce their alcohol intake (Australian Institute of Health and Welfare 2017). The main reason given for changing drinking behaviours was for health (50%) (Australian Institute of Health and Welfare 2017).
Children and young people

In 2016, 7.9% of young people aged 12–15 years and 43.8% of adolescents aged 16–17 years reported consuming at least one full serve of alcohol (defined as 1 standard drink) in the past 12 months (Australian Institute of Health and Welfare 2017). A friend or an acquaintance (48.1%) and parents (35.2%) were the most common source to supply adolescents their first glass of alcohol (Australian Institute of Health and Welfare 2017).

A small proportion (5.4%) of children and young people (aged 12–17 years) reported consuming more than four standard drinks on a single occasion at least once a month (figure 3.3) (Australian Institute of Health and Welfare 2017).

Over time, the proportion of people aged between 12–17 years abstaining from alcohol has significantly increased from 54.3% in 2004 to 81.5% in 2016 (Australian Institute of Health and Welfare 2017). Moreover, the average age at which young people first tried alcohol has risen from 14.8 years (2004) to 16.1 years (2016) (Australian Institute of Health and Welfare 2017).
Pregnant and breastfeeding women

In 2016, most Australian women (55.6%) abstained from alcohol when pregnant; this increased from 40.0% in 2007 (Australian Institute of Health and Welfare 2017). Despite the increase in the proportion of women abstaining from alcohol, more than one third of women (34.7%) reported drinking alcohol when pregnant. However, once women found out they were pregnant, many reduced their alcohol consumption. Of those who did drink alcohol during their pregnancy, approximately half (48.7%) consumed alcohol before they knew they were pregnant and just over a quarter (25.2%) consumed alcohol after they knew they were pregnant (Australian Institute of Health and Welfare 2017).

Among those who drank alcohol while pregnant, 81% consumed alcohol monthly or less and 16.2% consumed alcohol 2 to 4 times a month (Australian Institute of Health and Welfare 2017). When drinking, most pregnant women (97.3%) consumed 1-2 standard drinks (Australian Institute of Health and Welfare 2017).

A similar trend for breastfeeding women was seen, with 41.9% of breastfeeding women abstaining from alcohol in 2016, compared with 25.0% in 2007 (Australian Institute of Health and Welfare 2017).

Indigenous Australians

Indigenous Australians are more likely than non-Indigenous Australians to abstain from alcohol (30.6% and 22.6% respectively) (Australian Institute of Health and Welfare 2017). However, of those who do drink, a higher proportion of Indigenous Australians drink at risky levels than non-Indigenous Australians.

In 2016, 20.4% of Indigenous Australians reported consuming more than 2 standard drinks per day on average, compared with 17.0% of non-Indigenous Australians. A higher proportion of Indigenous Australians also reported drinking more than 4 standard drinks on a single occasion at least monthly (35.0% and 25.3% respectively) (Australian Institute of Health and Welfare 2017).
Older people
In 2016, most adults aged 60–69 (78.7%) and 70 years and over (70.4%) reported consuming at least one full serve of alcohol in the past 12 months (Australian Institute of Health and Welfare 2017). Overall 18.2% of adults aged 60–69 and 11% of adults aged 70 years and over, consumed on average more than 2 standard drinks per day; 17.3% of people aged 60–69 and 7.2% aged 70 years and over consumed more than 4 standard drinks on one occasion at least once a month (Australian Institute of Health and Welfare 2017).

Older people reported drinking more regularly than those in younger age groups. Those aged 70 years and older were the most likely age group to drink daily, for both males (19.5%) and females (8.7%) (Australian Institute of Health and Welfare 2017).

Very high alcohol consumption
While most Australians consume alcohol and do so at levels within these Guidelines, some people drink at substantially higher levels.

In 2016, 15.4% of Australians aged 14 years and older reported consuming 11 or more standard drinks on a single drinking occasion in the past 12 months and 7.1% reported doing so at least monthly (Australian Institute of Health and Welfare 2017).

Young adults (aged 18–24 years) were more likely than people in other age groups to consume 11 or more standard drinks on a single occasion at least yearly (28.9%) and at least monthly (15.3%) (Australian Institute of Health and Welfare 2017).

For most age groups (including young adults 18–24 years), the proportion of people drinking 11 or more standard drinks per occasion has remained similar or declined over time. However from 2013–2016, the proportion of people aged 50–59 (2013, 9.1%; 2016, 11.9%) and 60–69 (2013, 4.7; 2016, 6.1%) drinking 11 or more standard drinks (on a single occasion) at least once in the past 12 months increased. For those aged 50–59, there was also an increase in the proportion of people drinking 11 standard drinks on a single occasion at least monthly (from 4.1% in 2013 to 5.8% in 2016).

Effects of alcohol
Different for each person
Drinking alcohol has both immediate and cumulative effects. Alcohol-related harm in individuals is influenced not only by the amount of alcohol consumed, but by a complex interaction between the age and experience of the drinker, their social environment, their genetics and general health.

Due to individual variability, there is no amount of alcohol that can be stated as safe for everyone. Factors that affect individual responses to alcohol include:

• **Amount of alcohol consumed, rate and pattern of consumption:** health risks increase if more alcohol is consumed over a shorter time period. Risks are also higher if a given amount of alcohol is consumed over fewer drinking occasions. Although drinking alcohol, even at low levels, can increase the risk of alcohol-related harm, the risks associated with drinking one drink every day of the week are significantly lower than the risk associated with drinking seven drinks on a single occasion.

• **Sex:** women are more susceptible to the direct physiological effects of alcohol than men; the immediate effects of alcohol occur more quickly and last longer for women. The same amount of alcohol leads to a higher blood alcohol concentration (BAC) in women than men because they tend to break down less alcohol in their stomachs, and they have a smaller body size, a lower proportion of lean tissue and smaller livers than men.
• At low levels of consumption, the physiological differences between women and men have only a small impact on lifetime risks of harm hence the guidelines are the same for men and women. But as consumption increases, lifetime risk increases at a faster rate for women. Men, however, tend towards higher levels of risk-taking behaviour than women and as a result, they have a greater overall risk of immediate harm from drinking (e.g. road crashes, falls, self-harm).

• **Age**: younger and older people are more vulnerable to the harmful effects of alcohol than other adults. Young people’s physical immaturity, developing brain and inexperience of drinking and its effects - combined with an increase in risk-taking behaviours - expose them to a greater risk of harm. Similarly, older people’s risk of harm is also increased as the ability to break down alcohol and their tolerance for alcohol decreases and the risk of falls and driving accidents and the potential for adverse interactions with medications increase with age.

• **Mental health conditions**: people who have, or are prone to, mental health conditions (e.g. anxiety and depression, schizophrenia) may have worse mental health symptoms after drinking.

• **Physical health conditions**: people who have health conditions caused or exacerbated by alcohol are at risk of the condition becoming worse if they drink alcohol. Examples of such conditions include: alcohol dependence, any sort of liver disease (e.g. alcoholic hepatitis or cirrhosis; non-alcoholic fatty liver disease or viral hepatitis), pancreatitis and epilepsy.

• **Medication and drug use**: alcohol can interact with a wide range of over-the-counter and prescribed medications, herbal preparations and illicit drugs. This can alter the effect of either the alcohol or the other substances and has the potential to cause serious harm to both the person drinking and to others.

• **Family history of alcohol dependence**: people who have a family history of alcohol dependence (particularly among first-degree relatives) have an increased risk of developing alcohol dependence themselves.

These guidelines provide advice for the general Australian population on how to keep their risk of alcohol-related harm low. As alcohol affects everyone differently (due to individual characteristics and variability in biological responses) people should take into consideration their own individual characteristics as well as their own attitudes to risk.

**How the body processes alcohol**

Alcohol usually starts to affect the brain within five minutes of being swallowed. The blood alcohol concentration (BAC) reaches its peak about 30–45 minutes after the consumption of one standard drink (10g alcohol). Consuming multiple drinks in quick succession results in a higher BAC as the liver has a relatively fixed rate of metabolism, regardless of how many drinks are consumed.

It generally takes about one hour for the body to process one standard drink, although this varies on an individual basis. The rate of metabolism depends on factors such as liver size, body mass and composition, and levels of alcohol metabolising enzymes. Eating when drinking alcohol slows the increase in BAC as food in the stomach reduces the speed at which alcohol is absorbed into the bloodstream. However, activities such as drinking coffee, having a cold shower, vomiting or exercise do not reduce BAC. After a very heavy drinking occasion, it takes many hours for the BAC to return to zero.

**Immediate and cumulative effects of alcohol**

At the individual level, the effects of alcohol consumption include:

• Direct or indirect toxicity to several organs and body systems.

• Increasing the risk of a range of harms after acute intoxication, such as accidents.

• Harms related to alcohol dependence.
Negative impacts on health are dependent on a range of factors (for example, frequency of drinking, level of consumption) and can be observed in both the short- and long-term.

**Immediate effects**

The immediate effects of alcohol are on the brain, beginning with feelings of relaxation, wellbeing and loss of inhibitions. Many people who drink seek these effects when drinking socially. Alcohol reduces activity in the brain’s arousal, motor and sensory centres, which diminishes reactions to stimuli. It affects coordination, speech, cognition and the senses.

As the intake of alcohol increases on a single occasion, negative effects are observed, such as drowsiness, loss of balance, nausea and vomiting. An initial adverse effect of alcohol consumption is the potential decrease in fine motor skills and the loss of inhibitions. Individuals can also experience impaired judgement about their level of intoxication and its potential consequences. When the BAC reaches a high enough level, it can lead to life-threatening events such as loss of consciousness and inhibition of breathing.

As well as its direct effects on the body, the amount of alcohol consumed on a single occasion affects the risk of accidents and injury during and immediately after drinking. Each additional drink can increase the risk of injury and death for the drinker and may place others at risk of harm. Adolescents and young adults are particularly vulnerable to these harms as their use of alcohol in social situations can contribute to a pattern of risk-taking behaviour. Alcohol consumption reduces the cognitive or verbal capacity to resolve conflicts, thereby increasing the likelihood of physical violence and other aggressive behaviours.

**Cumulative effects**

The cumulative effects of alcohol are those from drinking on many occasions over an extended period of time. Alcohol consumption has been associated with a range of chronic diseases which have been summarised below.

- **Cardiovascular disease:** The effect of alcohol on the cardiovascular system is complex. Low levels of alcohol consumption have been found to be associated with protective effects against coronary artery disease in some studies and in certain age groups (Holmes et al 2014); however, recent evidence suggests that the magnitude of these effects is smaller than previously thought (see Guideline One 'Rationale'). The consumption of larger amounts of alcohol, whether as high single occasion doses or high cumulative lifetime levels, is harmful for the cardiovascular system. Harms include increases in the incidence of total and cardiovascular death, coronary and peripheral artery disease, heart failure, stroke, hypertension, dyslipidaemia and diabetes mellitus (Fernandez-Sola 2015). The Evidence Evaluation Report reported that drinking more than two drinks per day is associated with an increased risk of ischaemic stroke, and drinking more than four drinks per day is associated with an increased risk of haemorrhagic stroke (subarachnoid and intracerebral) (The University of Sydney 2018).

- **Cancers:** Alcohol is a Group 1 carcinogen (carcinogenic to humans; known to cause cancer), which causes oral cavity, pharyngeal, laryngeal, oesophageal, colorectal, liver and female breast cancers (International Agency for Research on Cancer 2012). A positive association between alcohol and pancreatic cancer has also been identified (International Agency for Research on Cancer 2012). This association has been seen with drinking patterns of more than two standard drinks per day (The University of Sydney 2018). The Evidence Evaluation Report reported on systematic reviews that concluded that varying levels and patterns of drinking alcohol ranging from low (about one standard drink per day) to higher levels (up to five standard drinks per day) are associated with an increased risk of breast, liver, pancreatic, colorectal mouth, throat (pharynx and larynx) and some oesophageal cancers.

- **Diabetes:** The Evidence Evaluation Report reported a decreased risk of type 2 diabetes with alcohol consumption at levels less than six standard drinks per day but the risk increases at higher levels, compared with current and lifetime abstainers (The University of Sydney 2018).
• **Nutrition-related conditions**: Alcohol can interfere with an individual’s nutritional status by affecting digestion, storage, use and excretion of nutrients. High levels of alcohol consumption are linked to malnutrition, Wernicke-Korsakoff syndrome, folate deficiency, Vitamin A depletion and pellagra.

• **Overweight and obesity**: Available evidence is conflicting on the effect of alcohol consumption and the risk of obesity. In general, low levels of alcohol consumption are not associated with weight gain but high levels of drinking are more consistently related to weight gain (Traversy and Chaput 2015). High levels of drinking can increase risk of liver disease in obesity.

• **Risks to babies during pregnancy and after birth**: Alcohol crosses the placenta and readily enters the bloodstream of the fetus. Drinking alcohol while pregnant increases the risk of a range of birth defects and growth and developmental problems, comprising Fetal Alcohol Spectrum Disorder, the effects of which may persist into adulthood. Alcohol also enters the breast milk, and can interfere with breastfeeding and infant behaviour.

• **Liver diseases**: Alcohol consumption over many years can cause cirrhosis of the liver. The presence of conditions such as viral hepatitis (e.g. hepatitis B or C) increases the effects of alcohol in contributing to the development and course of cirrhosis. Higher levels of alcohol consumption confer a large increase in risk of liver cirrhosis (The University of Sydney 2018).

• **Mental health conditions**: The relationship between heavier alcohol consumption and mental health issues is well documented. Alcohol use increases the risk of many mental health conditions such as depression and anxiety. Also, people with pre-existing mental health conditions are more at risk of using alcohol in a hazardous way. The combination of alcohol misuse and depression increases the risk of suicidal behaviour. Alcohol also may affect the efficacy of antidepressant medication.

• **Tolerance**: The immediate effects of alcohol on the brain are often less apparent in people who drink regularly, as they acquire a degree of tolerance. The person’s brain attempts to cope with, and compensate for, the deficits induced by alcohol. Also, the liver can become a little more efficient at breaking down alcohol. Despite this tolerance, the long-term effects of alcohol remain damaging, particularly as people who have greater tolerance for alcohol are likely to be those who experience higher blood alcohol levels more frequently.

• **Alcohol use disorder**: the World Health Organization’s International Classification of Disease (11th Revision, ICD-11) describes two main types of alcohol use disorders: harmful use (where alcohol is causing harm to self or others) or dependence. When a person is dependent on alcohol they have a strong drive to drink, which comes about after repeated, regular drinking. They have two of the three features: loss of control over drinking; physiological features (tolerance or withdrawal); and/or alcohol becomes a higher priority than other things in a person’s life.

• **The American Psychiatric Association**, in its Diagnostic and Statistical Manual of Mental Disorders (DSM-V) sees alcohol use disorders as a spectrum from mild to severe. Accordingly, it groups together the previous (DSM-IV) diagnoses of abuse and dependence as alcohol use disorders. The symptoms (criteria) which are counted to determine the severity of the condition include: consuming large amounts of alcohol over a longer-than-intended time period, persistent attempts to control alcohol use, having a craving for alcohol, drinking starting to affect work or home responsibilities and social activities, drinking in situations that might be physically hazardous, alcohol use continuing despite the person knowing that the alcohol is causing or exacerbating the condition, and displaying tolerance to or signs of withdrawal from alcohol.

• **Cognitive impairment**: High levels of alcohol consumption over the short- or long-term are associated with cognitive impairment. People who consume alcohol at harmful levels over the long-term have damaging structural and metabolic brain changes and an increased risk of dementia.
Social consequences and costs

Alcohol-related harm may affect family members, bystanders and the broader community. It can contribute to family disruption, violence, crime, road accidents, work-related harms and community safety issues (Laslett, Catalano et al. 2010; Australian Institute of Health and Welfare 2017; Callinan S and Livingston M in Laslett A-M et al 2019). Alcohol-related incidents are common (reported by 22.2% of the Australian population); ‘verbal abuse’ has the highest reported rates, followed by ‘being put in fear by someone under the influence of alcohol’, and ‘physical abuse’ (Australian Institute of Health and Welfare 2017). See Figure 3.4.

Harmful alcohol use represents a significant financial burden to society. An Australian study by Manning et al (2013), estimated costs to society from alcohol-related problems at $14.3 billion in 2010. However, the total cost is likely to be higher when costs associated with broader harms that occur to people other than the drinker are included. Laslett et al (2010) earlier estimated that the additional tangible and intangible costs of alcohol’s harm to others in 2008 were $14.2 and $6.4 billion respectively (Laslett et al. 2010).

Comparisons with international guidelines

There is no global consensus on the level of alcohol recommended to keep the risk of alcohol-related harm low. There is also no global consensus on whether women should drink as much as men or less, or on how a standard drink should be defined. Therefore, alcohol guidelines vary substantially from country to country. Figure 3.5 displays a comparison of recommendations on weekly upper limits of alcohol consumption for a selection of countries.
Figure 3.5. International comparison of recommendations on the upper limits of weekly alcohol consumption

(HealthLinkBC 2019; IARD, 2019)
4. Understanding risk

These revised guidelines are, like the previous 2009 edition, based on evidence and current understanding of the harms associated with drinking. While the evidence shows that there is no level of alcohol consumption that is completely safe, the guidelines provide recommendations and information on how to minimise the risk of alcohol-related harm.

What is risk?

Risk refers to a probability (or chance) that an outcome may occur (it is not certain that it will occur). For example, if you toss a coin there is one chance in two that the coin will land heads up. An average person’s risk of experiencing an adverse health outcome due to drinking alcohol is the probability (or chance) that the person will develop that outcome in a specified time period (e.g. across a lifetime).

Lifetime risk of alcohol-related harm is the accumulated risk from drinking, either on many occasions or on a regular basis over a lifetime (e.g. daily). The probability of dying (or “lifetime risk of death”) from a condition caused by exposure to hazardous substances is a common method of measuring risk.

Where do the estimates of risk of drinking alcohol come from?

The estimates of risk associated with drinking alcohol in these guidelines come from reviews of a number of studies that included large groups of people. These reviews help determine the probability (or chance) that an average person will develop a disease or injury over a certain period of time (e.g. over their lifetime) if they drink a given level of alcohol compared with drinking at a different level. There is a large amount of research in this area, and the results of any one study alone are not generally reliable. When the results of more studies are included, and they are consistent in how they were performed and how they measured the results, they can give a more thorough picture of what the risks might be and the results are strengthened.

These guidelines have assessed the evidence of many studies over time to determine the overall risk of drinking alcohol. In contrast, reports of new single studies in the media sometimes focus on individual studies rather than as a part of an evolving body of evidence. This can create confusion. It is important that public health guidelines are based on the assessment of a large body of evidence.

The risks of drinking alcohol: what the numbers mean

To reduce the risk of harm from alcohol (including disease, injury or death) these guidelines recommend that healthy men and women drink no more than 10 standard drinks per week and no more than four standard drinks on any one day. If people were to follow this advice consistently, the lifetime risk of dying from an alcohol-related disease or injury would be less than 1 in 100. This means that 1 out of every 100 Australians drinking at this level is likely to die of an alcohol related condition. The 1 in 100 figure is retained from the 2009 guideline.
The levels of alcohol consumption recommended by these guidelines may seem low or unrealistic to some, but they reflect the scientific evidence. It should be stressed that the risks of drinking alcohol can be reduced by drinking at or below these guideline limits; however, the guidelines do not eliminate all health risks at these levels.

Is this level of risk a concern?

Individuals make their own decision as to what level of risk is acceptable. People tend to accept much higher risks for behaviours they choose for themselves than for involuntary exposures to harmful substances; however, when it comes to alcohol, the level of acceptable risk appears to be even higher (Rehm J, et al. 2015). This may be due to the fact that drinking alcohol is generally socially acceptable and the consequences of drinking alcohol are not fully understood.

The social acceptability of drinking alcohol is directly influenced by its perceived benefits, and these are in turn determined by personal experience or enjoyment, advertising and the number of people partaking. These guidelines provide a reminder that all alcohol consumption comes with some degree of risk and that drinking within the levels recommended will reduce many of those risks to a low level. Understanding the risks helps Australians make informed choices about their health.

Are the risks the same for men and women?

Women are more susceptible than men to the direct physiological effects of alcohol. The immediate effects of alcohol occur more quickly and last longer for women and women will have higher blood alcohol concentrations after drinking the same amount of alcohol as men. However, at low levels of consumption, the physiological differences between women and men have only a small impact on the lifetime risks of harm but, as consumption increases, lifetime risk climbs at a faster rate for women.

Men, however, tend towards higher levels of risk-taking behaviour than women and, as a result, they have a greater overall risk of immediate harm from drinking (e.g. road crashes, falls, self-harm).

Hence the guidelines are the same for men and women. See Section 5.3.1 in Guideline One for more information.
5. Guideline One: Reducing the risk of alcohol-related harm over a lifetime

Guideline One

To reduce the risk of harm from alcohol-related disease or injury for healthy men and women, drink no more than 10 standard drinks per week and no more than 4 standard drinks on any one day.

The less you choose to drink, the lower your risk of alcohol-related harm. For some people not drinking at all is the safest option.

This guideline applies to healthy men and women aged 18 years and over. The guideline does not represent a ‘safe’ or ‘no-risk’ drinking level, nor does it set an absolute upper limit of intake. It identifies a level of drinking at which, on the basis of current scientific evidence, the risk of alcohol-related harm remains low over a lifetime, in terms of both risk of death from alcohol-related disease and death from alcohol-related injury.

Key messages

• This guideline provides recommendations to reduce the risk of alcohol-related harm, but these recommendations do not completely eliminate all risk from drinking alcohol.

• For both men and women, the risk of dying from alcohol-related disease and injury remains below 1 in 100 if no more than 10 standard drinks are consumed each week and no more than 4 standard drinks are consumed on any one day.

• Every drink above this level increases the lifetime risk of alcohol related disease and injury. This includes the risk of dying from alcohol-related disease or injury.

• Drinking less frequently, and drinking less on each day or drinking occasion, further reduces the lifetime risk of alcohol-related harm.

• This guideline applies to most healthy adults; however, there are some people who may be at greater risk of alcohol-related harm. These people may include, for example, pregnant and breastfeeding women, young adults aged 18–25 years, people aged over 60 years, people with mental or physical health conditions, people with a family history of alcohol dependence and people who use illicit drugs or take medications that interact with alcohol.

Footnote

1. Special precautions for children and young people under 18 years of age and women who are pregnant or breastfeeding are given in Guidelines 2 and 3.
5.1 Rationale

Most Australian adults drink alcohol, generally for enjoyment and sociability. At the same time, alcohol is known to cause harm. It is responsible for 4.5% of the total burden of disease and injury in Australia (AIHW 2019). It also leads to significant social and financial consequences for individuals and the community (AIHW 2019). Hence, reducing alcohol-related harm is a priority, including supporting the Australian community to make informed choices about alcohol. Providing advice on levels of alcohol consumption to reduce the risk of alcohol-related harm to health is therefore important.

To reduce the risk of harm from alcohol-related disease and injury it is recommended that healthy men and women drink no more than 10 standard drinks per week and no more than four standard drinks on any one day.

There are a number of considerations that underpin this recommendation. The advice in the 2009 version of these guidelines formed the basis of this revised edition. The advice has been updated when the evidence indicated this was required. Other key considerations are described below.

Acceptable risk thresholds

This guideline provides recommendations to reduce the risk of alcohol-related harm, but it does not completely rule out all risk from drinking alcohol. The ‘risk threshold’ chosen for this guideline is the maximum amount of alcohol that an average, healthy adult could drink, if they are prepared to accept a 1 in 100 chance of dying from alcohol-related disease and injury over their lifetime.

This risk threshold is consistent with the threshold used for the NHMRC 2009 Alcohol Guidelines. There was no compelling evidence to suggest the threshold should be changed.

The level of risk that people and societies consider ‘acceptable’ is influenced by whether the risk is involuntary or voluntary. Involuntary risks are those that people have no choice over (e.g. being exposed to potential toxins in water or soil) when a person is drinking water from the tap, or is in the garden. Voluntary risks are those which a person may have some choice over (e.g. driving a car or skydiving).

Generally, acceptable levels of risk for involuntary exposures are set much lower than for risky behaviours that are freely chosen. For example, the limit often used in Australia for toxins in drinking water is a risk of 1 in a million of dying (NHMRC 2011).

However, for behaviours that are seen as freely chosen, higher risks are routinely accepted by individuals (Rehm et al. 2014). In drinking alcohol, a person is (at least in some respects) voluntarily accepting these risks. It is important to bear in mind the fact that alcohol also causes harm to communities and to people other than the drinker. Although this guideline is based on evidence about direct harm to the individual, Guidelines Two and Three consider harms beyond the drinker.

Judgements about how acceptable a risk is are based on the assumption that there is some benefit to the individual in undertaking that risky activity. However, people do not only assess risk against benefits. They often take into account features such as control over the risk-taking, familiarity with the risk, how soon the harm would be experienced, whether the harm might be severe and whether the harm or benefit is short-term or long-term in nature. All these factors influence individual perceptions of what constitutes ‘high’ and ‘low’ risk.

So an individual’s perception of risk is complex, and the judgement about balancing risks and benefits may vary with the circumstances. Because of this, it is challenging to clearly communicate concepts of risk at a population level. The Expert Committee advised on using the threshold of a lifetime risk of dying from alcohol-related disease or injury of broadly 1 in 100 (i.e. one death for every 100 people). This risk threshold was maintained from the 2009 guidelines as the basis for guidelines on what could be seen as an acceptable risk from drinking in the present-day Australian society. The committee then looked into what level of alcohol consumption for a typical Australian drinker (who on average drinks three times
per week), is related to that level of risk. The committee also looked for a guideline that could be clearly communicated to the public. Given uncertainties over the existence and extent of the potential protective effects of alcohol (see below), if the committee had to ‘round up’ or ‘round down’ a consumption level, they chose to round down the amount of consumption, along the lines of the precautionary principle.

Guideline One in general aims to keep drinking below that risk level for the drinker, and is broadly compatible with a risk threshold of 1 in 100 for a person who drinks 3 times per week. This risk threshold may be seen as too high or too low by individual drinkers. This guideline (see Section 4.3) also presents tables and figures that illustrate how the risk of harm varies with levels of alcohol consumption for those who wish to guide their drinking by another level of risk (e.g. 1 in 50, 1 in 500 and 1 in 1000).

**Balancing the evidence on the range of effects of consuming alcohol**

Recent years have seen clearer evidence emerge about the harms of alcohol, including increased risks of cancer - even at lower levels of regular consumption. In the past, lower levels of alcohol consumption have been thought to provide some protection against cardiovascular diseases, particularly coronary heart disease. However, there is growing uncertainty about the evidence underpinning such ‘protective effects’ (The University of Sheffield 2019). This doubt has largely arisen because of improved approaches to research study designs. This includes the ability to use new kinds of evidence, such as ‘Mendelian randomisation studies’. These newer studies greatly reduce some of the challenges of earlier evidence. These challenges included the lack of clarity about changes in drinking patterns being due to illness, not because the person chose not to drink alcohol (and was otherwise healthy). They also include the challenge of having accurate information about the exposure to alcohol, due to the fact that a lot of earlier evidence is based on self-reporting of alcohol consumption, and this can often be inaccurate.

With regard to cardiovascular disease, the evidence of an association between increasing risks of stroke with increasing alcohol consumption has become clearer in recent years. The evidence also suggests that alcohol either may not protect against coronary heart disease, or that the extent of previous protection was overestimated. In addition, most studies which show cardiovascular benefits of low level alcohol consumption also show that such protection, if it exists, peaks at very low doses, for example at less than half to one standard drink per day (Di Castelnuovo et al. 2006). This is well below guidelines to reduce risk from drinking set by most countries.

If coronary heart disease protective effects do exist, the modelling for these guidelines shows it is likely that they only offset harms from alcohol in people aged 70 years and over. In those aged less than about 50 years, harms from alcohol outweigh these uncertain benefits. Because a large proportion of deaths occur at older ages, statistical modelling of the impact of alcohol on mortality can be greatly affected by whether or not it is assumed that there are health benefits from alcohol.

If there are protective effects for coronary heart disease in selected groups, the increased risk of alcohol consumption for other health conditions such as cancer still remains. Further, there are safer ways to reduce risk of coronary heart disease, such as by maintaining a healthy weight, reducing blood pressure and not smoking (The University of Sheffield 2019).

If such protective effects are overestimated, this could lead to the recommended alcohol consumption limits in the guidelines being too high. In this case, following the guidelines could expose the population to a risk greater than 1 in 100. By presenting alternate statistical models with potential protective effects either included or excluded (see Section 5.3 Patterns and levels of drinking), this report shows the magnitude of the impact of an assumption of protective effects of low levels of alcohol consumption on these guidelines. If the protective effects were excluded, the amount of alcohol able to be consumed so that the lifetime risk of dying from an alcohol-related disease or injury is less than 1 in 100 would be much less.

Despite the continued uncertainty over the existence and extent of any protective effect, this guideline is based on some consideration of protective effects of alcohol where indicated.
Describing frequency of drinking

Drinking frequency in this guideline refers to **days per week**. However, the evidence that underpins this recommendation is based on drinking occasions. A drinking occasion refers to a sequence of drinks taken without the blood alcohol concentration reaching zero. Sometimes the research evidence uses drinking days and drinking occasions interchangeably, or does not clearly distinguish between them.

**Average number of days Australian drinkers consume alcohol**

Analysis of Australian drinking patterns from the National Drug Strategy Household Survey found that, on average, Australians who do drink alcohol consume it on three days per week (see Appendix 1: Drinking frequency). This drinking pattern was used to interpret the modelling results (see modelling report on the public consultation portal) and inform the recommendations of this guideline.

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**5.2 Key info**

**Benefits and harms**

Drinking alcohol within this guideline has substantial net benefits, as opposed to drinking above it.

For both men and women, the risk of death from alcohol-related injury and disease remains below 1 in 100 if no more than 10 standard drinks are consumed each week and no more than 4 standard drinks are consumed on any one day.

**Certainty of the Evidence**

Systematic reviews of the literature on the health effects of consuming alcohol and mathematical modelling of the relationship between consumption and harm formed the evidence base for this guideline.

The systematic reviews considered the long-term health risks and benefits of alcohol consumption on the following health conditions:

- All-cause mortality.
- Cardiovascular disease: coronary heart disease, atrial fibrillation, heart failure, ischaemic stroke, intracerebral haemorrhage, subarachnoid haemorrhage and hypertension.
- Central neurological disorders: seizures and dementia and cognitive decline.
- Diseases of the digestive system: liver cirrhosis and pancreatitis.
• Other conditions: hip fracture, type II diabetes, gout, pneumonia and tuberculosis.

The systematic reviews also considered the short-term health risks and benefits of alcohol consumption on the following outcomes: injury, fatal motor vehicle injury, myocardial infarction or coronary event, ischaemic stroke and haemorrhagic stroke.

A systematic review of individual studies evaluating the association between alcohol consumption and mental health disorders and an additional systematic review of individual studies evaluating the association between different levels and patterns of alcohol consumption and long-term mild cognitive impairment also contributed to the evidence base for this recommendation.

The quality of the evidence included in these systematic reviews varied across the critical outcomes. Due to how GRADE rates epidemiological evidence typical of public health as low to very low, the certainty in the overall evidence was rated accordingly as very low.

Higher ‘quality’ study designs more typical for clinical practice guidelines – such as randomised control trials – are not appropriate for most public health interventions. Well-designed observational studies are often the best source of evidence on public health issues, but due to their study design, are often attributed a GRADE rating of low to very low.

The mathematical modelling examined relationships between consumption levels and mortality and morbidity, using parameters derived from Australian population data, Australian alcohol consumption data and risk functions largely derived from the systematic reviews.

Preference and values

It is expected that there is variation in how much value Australians place on the desirable and undesirable effects of alcohol consumption. It is also expected that there is variability in how much risk people are willing to take when it comes to consuming alcohol.

Despite the expected variability in people’s preferences and values, the Government has an important role in providing Australians with evidence-based recommendations to reduce harm from drinking alcohol.

The Foundation for Alcohol Research and Education’s (FARE) 2019 Annual Alcohol Poll reported:

• More than four in five Australians believe people have a right to know about alcohol-related harm.
• Three quarters (75%) of Australians believe that more needs to be done to reduce the harm caused by alcohol-related illness, injury, death and related issues (FARE 2019).

Resources and other considerations

Harmful alcohol use represents a significant financial burden to society. An Australian study by Manning et al (2013), estimated costs to society from alcohol-related problems at $14.3 billion in 2010. However, the total cost is likely to be higher when costs associated with broader harms that occur to people other than the drinker are included. Laslett et al (2010) earlier estimated that the additional tangible and intangible costs of alcohol’s harm to others in 2008 were $14.2 and $6.4 billion respectively (Laslett et al. 2010).

It is expected that if Australians consumed alcohol in line with this recommendation, there would savings in respect to the health costs to society from alcohol-related problems.
**Equity**

“Health equity is the notion that everyone should have a fair opportunity to attain their full health potential and that no one should be disadvantaged from achieving this potential if it can be avoided” (VicHealth 2015).

In Australia the disease and injury burden from alcohol use is skewed towards people in the lowest socioeconomic groups. In 2011, the greatest amount of burden was experienced by the lowest socioeconomic group (55,807 DALY; 5.2% of total DALY), while those in the highest socioeconomic group experienced the least burden (31,281 DALY; 4.4% of total DALY) (AIHW 2018).

It is expected that health equity would be increased if this recommendation is implemented and widely adopted by the Australian population. Drinking alcohol within the guideline recommendation aims to minimise the risk of alcohol-related harm for Australian men and women. In doing so, those currently disadvantaged by not being aware of these risks, will have a better chance of realising their full health potential.

The recommendation should not create new health inequities or worsen any current inequities, but if it is not effectively implemented it misses the opportunity to reduce inequities. The messages need to reach those most vulnerable to alcohol-related harm.

*Note: DALY=Disability adjusted life years*

**Acceptability**

It is expected that Australians will vary in their views regarding whether they consider this recommendation acceptable. However, it is expected that most Australians will find it acceptable for the Government to provide evidence-based advice to reduce harm from alcohol consumption.

In 2019, four in five Australians reported that they believe people have a right to know about alcohol-related harm and three quarters (75%) of Australians reported that more needs to be done to reduce the harm caused by alcohol-related illness (FARE 2019).

Furthermore, it is evident that there are many Australians who overestimate the amount of alcohol an adult can drink before putting their health at risk, which warrants the need for these recommendations.

The Australian Institute of Health and Welfare’s (AIHW) National Drug Strategy Household Survey reported:

- More than 30% of Australian males (aged 14 years or over) overestimated the number of standard drinks an adult male could consume before putting his health at risk over his lifetime and almost 60% overestimated the number of standard drinks an adult male could drink over a six hour period before he puts his health at risk.

- 9% of females (aged 14 years or over) overestimated the number of standard drinks an adult female could drink per day before putting her health at risk over her lifetime and more than 30% overestimated the number of standard drinks an adult female could drink over a six hour period before she puts her health at risk (AIHW 2017).
Feasibility

The recommendations are considered feasible to implement given they are similar to the 2009 recommendations, which the majority of the population drink in accordance with.

In 2016, approximately 17% of Australians exceeded NHMRC's lifetime risk guideline by drinking more than 2 standard drinks per day and 26% of Australians consumed 5 or more standard drinks on a single drinking occasion at least once a month (AIHW 2017).

The success of the guidelines in improving health outcomes is entirely dependent on their successful dissemination, public communications and ongoing community awareness raising about the guidelines (including to health professionals), which the Australian Government is responsible for.

5.3 Scientific evidence

These guidelines were informed by a comprehensive evaluation of the evidence, drawing on systematic reviews and meta-analyses. Systematic reviews are quantitative reviews of the scientific evidence, summarising data across multiple studies and conducted using standardised criteria and an approach that can be replicated into the future. Meta-analyses combine findings from existing studies.

Systematic reviews of the evidence on the health effects of alcohol consumption and mathematical modelling of the harms and benefits of alcohol consumption were conducted to update the evidence base for this guideline and its recommendations.

5.3.1 Systematic reviews

An overview of systematic reviews was completed to consider the short-term and long-term health risks and benefits associated with alcohol exposure (drinking alcohol) (report available on the public consultation portal). The analysis focused on identifying systematic reviews and meta-analyses published since 2007, to identify areas where the evidence has grown since the 2009 Alcohol Guidelines. Two additional systematic reviews were completed to fill evidence gaps for the association between drinking alcohol and mental health and cognitive impairment outcomes (reports available on the public consultation portal). A summary of the health outcomes included in the overview of systematic reviews and additional systematic reviews are outlined in Table 5.3.1.

Table 5.3.1. Summary of health conditions included in the overview and systematic reviews to inform Guideline One

<table>
<thead>
<tr>
<th>Health conditions</th>
<th>Long-term health conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-cause mortality</td>
<td>Ovarian cancer</td>
</tr>
<tr>
<td>Bladder cancer</td>
<td>Pancreatic cancer</td>
</tr>
<tr>
<td>Brain cancer</td>
<td>Prostate cancer</td>
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<tr>
<td>Breast cancer (pre-menopausal)</td>
<td>Stomach cancer</td>
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<tr>
<td>Breast cancer (post-menopausal)</td>
<td>Thyroid cancer</td>
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<tr>
<td>Cervical cancer</td>
<td>Coronary heart disease</td>
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<tr>
<td>Colorectal cancer</td>
<td>Atrial fibrillation</td>
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<tr>
<td>Endometrial cancer</td>
<td>Heart failure</td>
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<tr>
<td>Gallbladder cancer</td>
<td>Ischaemic Stroke</td>
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<tr>
<td>Kidney cancer</td>
<td>Intracerebral haemorrhage</td>
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### Health conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Condition</th>
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<tbody>
<tr>
<td>Liver cancer</td>
<td>Subarachnoid haemorrhage</td>
</tr>
<tr>
<td>Lung cancer</td>
<td>Hypertension</td>
</tr>
<tr>
<td>Hodgkin's lymphoma</td>
<td>Liver Cirrhosis</td>
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<tr>
<td>Non-Hodgkin's lymphoma</td>
<td>Pancreatitis</td>
</tr>
<tr>
<td>Leukaemia</td>
<td>Type II Diabetes</td>
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<tr>
<td>Multiple Myeloma</td>
<td>Dementia and cognitive decline</td>
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<tr>
<td>Melanoma</td>
<td>Seizures</td>
</tr>
<tr>
<td>Mouth and pharynx cancer</td>
<td>Hip fracture</td>
</tr>
<tr>
<td>Larynx cancer</td>
<td>Gout</td>
</tr>
<tr>
<td>Oesophageal squamous cell carcinoma</td>
<td>Pneumonia</td>
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<tr>
<td>Oesophageal adenocarcinoma</td>
<td>Tuberculosis</td>
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### Short-term health conditions

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
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<tbody>
<tr>
<td>Injury</td>
</tr>
<tr>
<td>Fatal motor vehicle injury</td>
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<tr>
<td>Myocardial infarction or coronary event</td>
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</table>

### Mental health conditions

<table>
<thead>
<tr>
<th>Condition</th>
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<tbody>
<tr>
<td>Depression/depressive symptoms</td>
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<tr>
<td>Anxiety/Anxiety symptoms</td>
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<tr>
<td>Bipolar disorder</td>
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</table>

### Cognitive impairment conditions

<table>
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<tr>
<th>Condition</th>
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<tbody>
<tr>
<td>Cognition</td>
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</table>

#### 5.3.2 Modelling

Together with the reviews of the published evidence (see Section 5.3.1 Systematic Reviews), Guideline One is informed by mathematical modelling which estimates the risk of dying from alcohol-related disease and injury from different levels and patterns of drinking. The model simulates the relationship between any given level of alcohol consumption and the risk of disease and death for different age groups in Australia. From this, alcohol consumption levels that corresponded with four different levels of risk of dying from alcohol-related disease or injury (1 in 1000, 1 in 500, 1 in 100, and 1 in 50) were identified.

The risk threshold chosen for this guideline corresponds to a 1 in 100 chance of dying from alcohol-related disease or injury for an average, healthy adult who drinks alcohol (see Guideline One Rationale). This is consistent with the threshold used in the NHMRC 2009 Alcohol Guidelines. The analyses from the modelling are outlined in more detail on the [public consultation portal](#).

Modelling was undertaken using an adaptation of the Sheffield Alcohol Policy Model v2.7. It is a mathematical simulation model which has previously been used to assess alcohol policy options in the United Kingdom and internationally.

The key data inputs into this Australian adaptation of the Sheffield Alcohol Policy Model were:

- Current levels and patterns of alcohol consumption in Australia.
- Data on alcohol-related morbidity (defined as person-specific hospital admissions) and mortality in Australia.
- International and Australia-specific evidence linking different levels and patterns of alcohol consumption to risk of morbidity or mortality for 42 separate health conditions causally related to alcohol consumption - these were drawn from the overview of systematic reviews (see Section 5.3.1 Systematic Reviews).
Conditions included in the model (outlined in Table 5.3.2) were divided into four categories:

1. **Partially-attributable, chronic**: These are conditions that can occur without drinking alcohol but for which the risk of them occurring changes with long-term exposure to alcohol (e.g. breast cancer).

2. **Partially-attributable, acute**: These are conditions that can occur without drinking alcohol but for which the risk of them occurring changes in the short-term with exposure to alcohol (e.g. falls).

3. **Wholly-attributable, chronic**: These are conditions that can only occur from drinking alcohol. The risk of these conditions occurring changes with long-term exposure to alcohol (e.g. alcoholic liver disease).

4. **Wholly-attributable, acute**: These are conditions that can only occur from drinking alcohol. The risk of them occurring changes with short-term exposure to alcohol (e.g. alcohol poisoning).

Table 5.3.2. Alcohol-attributable health conditions included in the Australian adaptation of the Sheffield Alcohol Policy Model

<table>
<thead>
<tr>
<th>Partially alcohol-attributable chronic conditions</th>
<th>Partially alcohol-attributable acute conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouth, pharynx and larynx cancer</td>
<td>Intentional self-harm</td>
</tr>
<tr>
<td>Oesophageal cancer</td>
<td>Unintentional falls (without hip fracture)</td>
</tr>
<tr>
<td>Stomach cancer</td>
<td>Unintentional falls (with hip fracture)</td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td>Accidental poisoning (by drugs, medicaments, biological substances and other nonmedicinal substances)</td>
</tr>
<tr>
<td>Liver cancer</td>
<td>Acute poisoning (other)</td>
</tr>
<tr>
<td>Pancreatic cancer</td>
<td>Motor vehicle injury</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>Other injury and poisoning</td>
</tr>
<tr>
<td>Prostate cancer</td>
<td>Acute myocardial infarction</td>
</tr>
<tr>
<td>Non-Hodgkin's Lymphoma</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
</tr>
<tr>
<td>Chronic ischaemic heart disease</td>
<td></td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wholly alcohol-attributable chronic conditions</th>
<th>Wholly alcohol-attributable acute conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcoholic cardiomyopathy</td>
<td>Alcoholic cardiomyopathy</td>
</tr>
<tr>
<td>Alcoholic liver disease</td>
<td>Alcoholic polyneuropathy</td>
</tr>
<tr>
<td>Acute pancreatitis (alcohol-induced)</td>
<td>Alcoholic myopathy</td>
</tr>
<tr>
<td>Chronic pancreatitis (alcohol-induced)</td>
<td>Alcohol-induced pseudo-Cushing’s syndrome</td>
</tr>
<tr>
<td>Alcoholic gastritis</td>
<td>Mental and behavioural disorders due to alcohol</td>
</tr>
<tr>
<td>Excess blood alcohol levels (including alcohol poisoning)</td>
<td></td>
</tr>
</tbody>
</table>
In order to model the impacts of drinking on the above health conditions, drinking behaviour in the model was defined as:

- Mean (average) weekly alcohol consumption (in standard drinks) for long-term exposure to alcohol.
- The amount of alcohol consumed on a person’s heaviest drinking day during the last year (peak daily consumption) for short-term exposure to alcohol.

The model divided the Australian population into 30 groups defined by their age and sex. It combined the risk estimates for each condition to produce an overall estimate of each group’s risk of dying due to alcohol for any given level of mean weekly and peak daily alcohol consumption.

From these estimates, a set of risk curves (curves which show the relationship between lifetime risk of alcohol-attributable mortality and different levels of mean weekly alcohol consumption) were derived for men and women. The curves varied depending on how people who drink spread their alcohol consumption across the week as this affects peak daily consumption and therefore the risk of acute conditions. For example, in the model it was assumed that consuming 20 standard drinks in one day had a greater risk of acute conditions than spreading those drinks evenly over seven days, while the risk for chronic conditions stayed the same (except for certain circumstances associated with chronic ischaemic heart disease – see modelling report on the public consultation portal). Interpreting the modelling results relied predominantly on estimates assuming drinking was spread across three days a week. This is the average number of days per week that Australians (who consume alcohol) drink, based on analyses of drinking patterns from the National Drug Strategy Household Survey (see Appendix 1: Drinking frequency).

### 5.3.3 Additional scientific evidence

To complement the systematic reviews and the mathematical modelling (outlined in Section 5.3.1 and 5.3.2 respectively), NHMRC made a public call for submissions of evidence on health risks and benefits of alcohol consumption. The public call for evidence helped identify relevant studies and gaps in the evidence, and identified areas of concern for the public and stakeholders. The public call had clear inclusion and exclusion criteria to ensure only studies of a reasonable quality were accepted (see Appendix 2: Administrative report). Given this call was not a formal systematic review, the submitted evidence could not be evaluated using the GRADE approach that was used for the systematic reviews (Appendix 2: Administrative report). Instead, the evidence from the public call was considered along with the evidence from the NHMRC 2009 Alcohol Guideline, systematic reviews and modelling to inform the narrative text for this guideline.

### 5.4 Where has the evidence changed?

Research since the 2009 Australian Guidelines to Reduce Health Risks from Drinking Alcohol has reinforced earlier evidence on the risks of alcohol-related harm for a range of chronic diseases, accidents and injuries. In addition, the growing body of evidence shows:

- The relationship between certain cancers and low levels of alcohol consumption (less than one standard drink per day) is now stronger than previously recognised (The University of Sydney 2018).
- Drinking alcohol increases the risk of a number of cancers including breast, liver, pancreatic, colorectal, oesophageal, mouth and throat (pharynx and larynx) cancer (The University of Sydney 2018). The level of risk increases as more alcohol is consumed.
- Lower levels of alcohol consumption were thought to provide some protection against coronary heart disease and type 2 diabetes, with peak protection at around ½ - 1 standard drink per day. There is now greater uncertainty about the evidence that supports this ‘protective effect’ (The University of Sheffield 2019).
5.5 Patterns and levels of drinking

In establishing this recommendation, both patterns and levels of drinking were considered. ‘Patterns of drinking’ refers to the frequency of drinking occasions and amounts consumed per occasion, while ‘levels of drinking’ refers to the amount of alcohol consumed over a specific period, such as a week. The combination of both patterns and levels of drinking represents a person’s ‘exposure’ to alcohol and relates to the associated risk of health harm.

Figure 5.5.1 presents the absolute risk curves for men, showing the relationship between average weekly alcohol consumption and the total lifetime alcohol-attributable mortality risk. The level of risk is influenced by how people who drink spread their consumption over time (i.e. whether evenly across seven days, within one day, or another variation within this range). Figure 5.5.2 presents the same information for women. Recent evidence shows that on average, adults who drink in Australia consume alcohol approximately 3 days per week (see Appendix 1: Drinking frequency).

All of the risk curves show higher risks of dying from alcohol-related conditions with higher levels of alcohol consumption and with drinking concentrated on fewer days per week. These curves also include consideration of a protective effect of alcohol on mortality – which is increasingly being questioned (see Guideline One Rationale).

![Figure 5.5.1. Absolute lifetime risks of death caused by alcohol for Australian men by drinking frequency](image-url)
The risk threshold selected for this guideline was a 1 in 100 (1%) chance of dying from an alcohol related condition (see Guideline One Rationale). Table 5.3.1 presents consumption levels corresponding to this risk threshold and provides a comparison of consumption levels with alternative thresholds: 0.1% (1 in 1,000), 0.2% (1 in 500) and 2.0% (1 in 50).

Considering the pattern of consumption of alcohol in Australia of three days per week, the number of standard drinks corresponding to the 1% risk threshold is 12.5 standard drinks per week for men and 10.5 standard drinks per week for women (Table 5.5.1).

Table 5.5.1. Number of standard drinks per week associated with alternative mortality risk thresholds, depending on number of days alcohol is consumed per week

<table>
<thead>
<tr>
<th>Drinking frequency</th>
<th>Risk level</th>
<th>Standard drinks (per week)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1% (1 in 100)</td>
<td>0.1% (1 in 1,000)</td>
</tr>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td>20.2</td>
<td>18.5</td>
</tr>
<tr>
<td>6 days/week</td>
<td>18.6</td>
<td>17.1</td>
</tr>
<tr>
<td>5 days/week</td>
<td>16.9</td>
<td>15.5</td>
</tr>
<tr>
<td>4 days/week</td>
<td>14.9</td>
<td>13.6</td>
</tr>
<tr>
<td>3 days/week</td>
<td>12.5</td>
<td>11.3</td>
</tr>
<tr>
<td>2 days/week</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>1 day/week</td>
<td>4.1</td>
<td>3.4</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td>15.3</td>
<td>14</td>
</tr>
<tr>
<td>6 days/week</td>
<td>14.5</td>
<td>13.3</td>
</tr>
<tr>
<td>5 days/week</td>
<td>13.5</td>
<td>12.3</td>
</tr>
</tbody>
</table>
In any public health guideline, it is important that advice be consistent, clear and cautious, erring on the side of protecting health. To check that the recommendations are robust when different types of evidence are considered and what happens when that evidence might vary, alternative scenarios were considered. The impact of the different considerations and scenarios on the weekly drinking amounts corresponding to risk levels are outlined in Table 5.5.1 and 5.5.2.

Some individuals may consider the 1% risk threshold either too high or too low, and may wish to be more or less cautious. Some international guidelines consider a 0.1% or 1 in 1,000 risk more appropriate. This 0.1% risk was still broadly compatible with the recommended 10 standard drinks per week. A 2% risk (1 in 50), however, was associated with only a slightly higher level of alcohol consumption than specified in this guideline (11.6 and 13.8 standard drinks per week for women and men respectively).

Further, the guidance is based on the average number of days per week individuals drink alcohol. Table 5.5.1 shows that if individuals drink only once a week, then the weekly limit at the 1% level would be 4.1 standard drinks for men and 4.7 standard drinks for women. If individuals drink daily then the corresponding figures for the weekly limit are 20.2 and 15.3 standard drinks respectively.

Finally, if alcohol does not have any protective effects, the weekly alcohol consumption that corresponds to a given risk level is much lower than in the general model on which the main recommendations are based (column SA1: no protective effects; Table 5.5.2), being below 3 standard drinks per week for both men and women.

These different scenarios show that there are still some uncertainties about the consumption level that relates to the 1.0% risk threshold (the 1 in 100 chance of dying from alcohol-related harm). This is because of the scientific debate about whether or not alcohol has protective effects at lower levels of consumption. However, the evidence is clear that consumption at higher levels leads to overall harm.

This guideline aims to strike a balance, incorporating what is known about average drinking patterns and the harms related to different levels of consumption while acknowledging uncertainties in the evidence, particularly about protective effects. Ultimately, some consideration of the protective effects of alcohol is taken into account in determining the recommended number of standard drinks, while erring on the side of caution.
Table 5.5.2. Number of standard drinks per week associated with alternative mortality risk thresholds, depending on number of days alcohol is consumed over a week

<table>
<thead>
<tr>
<th>Drinking frequency</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Main result</td>
<td>SA1: No protective effects</td>
</tr>
<tr>
<td>Daily</td>
<td>20.2</td>
<td>2.9</td>
</tr>
<tr>
<td>6 days/week</td>
<td>18.6</td>
<td>2.8</td>
</tr>
<tr>
<td>5 days/week</td>
<td>16.9</td>
<td>2.5</td>
</tr>
<tr>
<td>4 days/week</td>
<td>14.9</td>
<td>2.6</td>
</tr>
<tr>
<td>3 days/week</td>
<td>12.5</td>
<td>2.5</td>
</tr>
<tr>
<td>2 days/week</td>
<td>9</td>
<td>2.6</td>
</tr>
<tr>
<td>1 day/week</td>
<td>4.1</td>
<td>0</td>
</tr>
</tbody>
</table>

SA = sensitivity analysis

5.5.1 Differences between men and women

Women are more susceptible to the direct physiological effects of alcohol than men; the immediate effects of alcohol occur more quickly and last longer for women. The same amount of alcohol leads to a higher blood alcohol concentration (BAC) in women than men because they tend to break down less alcohol in their stomachs; they have a smaller body size, a lower proportion of lean tissue and smaller livers than men. At low levels of consumption, the physiological differences between women and men have only a small impact on lifetime risks of harm but as consumption increases, lifetime risk of harm increases at a faster rate for women. Men, however, tend towards higher levels of risk-taking behaviour than women and as a result, they have a greater overall risk of immediate harm from drinking (e.g. road crashes, falls, self-harm).

Figure 5.5.3 compares the risk curves for men and women who spread their alcohol consumption evenly across 5 days/week. This figure illustrates that women have a higher risk of dying from disease or injury caused by alcohol than men at all levels of consumption. The absolute difference is small when drinking at lower levels and larger when drinking at higher levels. This general trend applies regardless of how people spread their drinking across a week.
5.6 How was this recommendation developed?

Combining all of the above data and information, including the systematic reviews (see Section 5.3.1), mathematical modelling (see Section 5.3.2), and additional evidence (see Section 5.3.3), the Expert Committee determined the most appropriate and scientifically supported recommendation for the maximum number of standard drinks that healthy Australians may consume before substantially elevating their risk of dying from alcohol-related disease or injury.

Current evidence indicates that Australian adults who consume alcohol, do so on average three days per week (see Appendix 1: Drinking frequency). Given this frequency of alcohol consumption, 10 standard drinks per week corresponds to a 1 in 100 risk of dying from alcohol-related disease or injury for men and women (see Guideline One Rationale). Consuming 4 standard drinks on any one day for both men and women is also consistent with this risk threshold.

These levels of consumption represent the appropriate evidence-based guidance at this point in time for Australians. It takes into consideration the average patterns of drinking in Australia, the need to have straightforward advice that can be used by both men and women, and the uncertainty about protective effects outlined above.

5.7 Other considerations about the harms associated with drinking alcohol

The immediate risk of harm from drinking alcohol increases as the amount of alcohol consumed increases. A person’s blood alcohol concentration (BAC) reflects the amount of alcohol consumed and the level of risk they may experience from the acute effects of alcohol. There are some situations where the immediate risk of harm from drinking alcohol is higher, than for the same amount of consumption in another context. The following sections describe these situations.

5.7.1 Activities that require attention, concentration or psychomotor skills

A raised BAC is associated with reduced performance, which is important information for those undertaking activities that require attention, concentration or psychomotor skills.

Evidence reported in the 2009 NHMRC Alcohol Guidelines showed that while BACs of up to 0.05 may not significantly impair psychomotor performance, they invoke a level of drowsiness sufficient to impair performance. For example, maritime cadets showed significant reductions in their ability to concentrate and plan, diminished attention and accuracy, and an increased risk disposition at a BAC of 0.02. Also, in 44% of all watercraft-related drownings reported in an American study, the deceased had a BAC reading of 0.05 or higher (Browne, Lewis-Michl et al. 2003; Ritz-Timme, Thome et al. 2006).

Given alcohol consumption affects performance and the acute effects of drinking can endanger the lives of the person and others, in some situations not drinking is the safest option. These include:

• When taking part in activities that require attention, concentration or psychomotor skills for example, but not limited to driving, water activities, snow sports, flying an aircraft or operating heavy machinery.
• When supervising others who are taking part in such activities.
• When supervising children.
The acute harmful effects of alcohol may be increased by interactions between alcohol and illicit drugs. They can also be increased by interacting with prescribed and over-the-counter medications and sedative substances.

5.7.2 Driving
Drinking at levels resulting in a BAC greater than 0.05 can interfere with coordination and judgement, and so increase the risk of motor vehicle accidents (The University of Sydney 2018; U.S. Department of Transport 2000). Australian State and Territory laws set a maximum BAC of 0.05 while driving for full licence holders and require a BAC of zero for learner and provisional drivers.

Those who operate commercial aircraft, public or heavy vehicles, commercial vessels, machinery, and mobile plant or farm equipment may be required to comply with a lower BAC to protect public safety.

5.8 Special population groups
While this guideline applies to most healthy men and women, there are some people who may experience an increased risk of harm if they drink alcohol and may need to seek professional advice about drinking. These include:

- Pregnant and breastfeeding women.
- Young adults aged 18-25 years.
- People aged over 60 years.
- People with physical health conditions affected by alcohol.
- People with mental health conditions.
- People with a family history of alcohol dependence.
- People who use illicit drugs or take medications that interact with alcohol.

5.8.1 Pregnant and breastfeeding women
(A) To reduce the risk of harm to their unborn child, women who are pregnant should not drink alcohol.

(B) For women who are breastfeeding, not drinking is safest for their baby.

Additional information for women who are planning a pregnancy, or who are pregnant or breastfeeding is included in Guideline Three. This includes the evidence base that underpins the recommendations above.

5.8.2 Young adults aged 18–25 years
Young adults aged 18-25 years are likely to be at an increased risk of alcohol-related harm, particularly injury. In addition to following Guideline One, young adults are encouraged to take steps to minimise their risk of accidents and injury and other harms related to alcohol. The issues for young adults are similar to those for adolescents (see Guideline Two), specifically:

- Alcohol affects the young person’s developing brain. Drinking, particularly heavy drinking, at any time before brain development is complete (which is not until around 25 years of age) may adversely affect later brain function.

- Like adolescents, young adults tend to be greater risk takers than older adults, a factor that is reflected in the high levels of injuries sustained by this age group.

- Young people are less experienced at certain tasks that require attention and psychomotor coordination.
5.8.3 People aged over 60

For some people aged over 60 years, drinking alcohol increases the risk of falls and injuries, as well as some chronic conditions. They are more vulnerable to the effects of alcohol due to changes in their body composition, decreased metabolic capacity, having other health conditions and taking medications that regulate these conditions (Aira et al 2005). People in this age group are advised to consult their health professional about the most appropriate level of drinking for their health.

5.8.4 People with physical health problems that are affected by alcohol

Drinking leads to poorer outcomes for people with certain diseases and conditions, including alcohol-related diseases. Anyone with one of these conditions, or any other problem that might be affected by alcohol, should discuss their alcohol intake with a health professional. In many instances, temporary or permanent abstinence may be necessary.

Alcohol-related diseases

For people who have serious diseases directly related to alcohol consumption (e.g. cirrhosis of the liver or alcoholic pancreatitis), further drinking is likely to aggravate the condition (Majumder et al 2016; Mathurin et al. 2015). This can cause immediate problems or worsening of the prognosis in the longer term.

Diabetes

People with diabetes may need to take special precautions with drinking and should discuss alcohol use with a health professional. Alcohol can interfere with the action of insulin, or of medicines which promote the release of insulin (insulin secretagogues) and of glucagon. Alcohol can increase the risk of hypoglycaemia in people with type 1 or 2 diabetes who take these medications, particularly if they drink on an empty stomach (ADA 2007; CMP Medica 2007). Alcohol can also worsen medical conditions associated with diabetes, such as liver disease and advanced neuropathy (ADA 2007; Tolman et al 2007).

Other conditions affected by alcohol

People with other health conditions may also need to seek medical advice about drinking, as alcohol may worsen the condition or interfere with treatment.

- Surgical conditions – alcohol can increase the risk of complications of surgery, including infections, and can slow wound healing. Some centres recommend abstinence in the month before surgery (Tonnesen et al. 1999).
- Infectious diseases – heavy alcohol consumption may impair immune function, leading to an increased risk of infections including skin and respiratory infections. Those who contract infections and drink alcohol tend to have poorer outcomes (Sulis 2003).
- Liver diseases of any form – drinking alcohol can increase the severity of liver damage in those with hepatitis C, non-alcoholic fatty liver and other drug-induced liver injury. Reducing alcohol consumption can restrict the severity of liver injury in those with other liver disorders (Ostapowicz et al 1998, 2001; Marcellin et al 2008).
- Sleep disorders – alcohol causes interruptions to normal sleep patterns, in particular the later, heavier part of the sleep cycle (Castañeda et al 1998). While alcohol may induce sleep in the short term, it leads to increased arousal and wakefulness several hours after consumption (Castañeda et al 1998; Peppard et al 2007). Sleep disruption and chronic sleep deprivation can increase the risk of injury, disrupt cognitive processes and trigger a variety of mental health conditions (Castañeda et al 1998; Williamson and Feyer 2000; Drummond et al 2006).
- Sexual dysfunction – alcohol use can cause or exacerbate a range of sexual problems in males and females. At low levels, alcohol can reduce inhibition and increase sexual desire (Cheng et al 2007). In females who consume alcohol heavily, the likelihood of heavy or irregular menstrual periods, spontaneous abortion and infertility is greater when alcohol is consumed above the guideline levels (Bradley et al 1998).
5.8.5 People with mental health conditions

Alcohol plays a complex role in the development and progression of mental health conditions. Drinking can lead to poorer outcomes for people who have a mental health condition, whether it is a common condition such as depression or a less common condition such as schizophrenia. Anyone at risk of, or under treatment for a mental health condition should discuss their alcohol intake with a health professional.

Recommendations about drinking will vary depending on the presenting mental health condition and medication regimes. In many instances, temporary or permanent abstinence may be necessary. However, in some instances (e.g. for stabilised patients) the recommendations for the general population may apply.

People with, or at risk of, a mental health condition are more likely to use alcohol than those without this risk (Kessler et al 1997). Drinking can promote the development of mental health conditions in at-risk people (e.g. those prone to depression and/or anxiety) (Degenhardt et al 2001; Cornelius et al 2003; Nunes & Levin 2004; Clark et al 2003; Currie et al 2005; Haynes et al 2005). Rates of alcohol use disorders also appear to be higher among individuals with mental health conditions, including post-traumatic stress disorder, social phobias and panic disorder, depression, bipolar disorder and schizophrenia (Kranzler et al 1996; Merikangas et al 1996; Hodgins et al 1999; Burns & Teesson 2002; Schuckit 2006; Arunogiri & Lubman 2015; Baker et al 2012).

5.8.6 People with a family history of alcohol dependence

People with a family history of alcohol-related problems, including alcohol dependence, are at greater risk of developing problematic patterns of drinking than the general population. Anyone with a close relative with alcohol dependence should consider discussing their alcohol intake with a health professional.

Family history is a strong predictor of developing an alcohol use disorder. The children of parents with alcohol dependence are at significantly greater risk of dependence than those of parents without alcohol use disorders (Haber et al 2005; Capone & Wood 2008).

Genetics

Genetic factors play an important role in how an individual responds to alcohol. This includes their risk of dependence or tissue injury.

Some individuals inherit variations of the genes that encode the enzymes that regulate alcohol metabolism (alcohol dehydrogenase, aldehyde dehydrogenase and microsomal P4502E1) (Gemma et al 2006). This may influence their susceptibility to heavy drinking, alcohol dependence and alcohol-related liver disease (Stickel et al 2017).

Animal models and human studies suggest familial risk of alcohol dependence can be influenced by genes encoding DRD2 and ANKK1 (Bauer et al 2007; Carr et al 2007; Dick et al 2007). While the studies are of great interest it is not possible at this stage to use genetic testing as a means of identifying individuals at increased risk of alcohol dependence or alcohol-related tissue damage with the degree of accuracy that clinicians or individuals desire. Multiple genes influence risk and the contribution of any one gene to these risks appears small in most situations.

5.8.7 People who use illicit drugs or take medications that interact with alcohol

Illicit drugs

Consuming alcohol together with illicit drugs can have dangerous or lethal consequences. When drugs such as cannabis, methamphetamine, ecstasy, cocaine and heroin are used with alcohol, this places people at greater risk of harm. Many studies have reported that any level of alcohol consumption is a significant predictor of non-fatal and fatal drug overdose (e.g. Kaye & Darke 2004; Coffin et al 2007). People who use illicit drugs can be unaware of the potentiating effects of alcohol and illicit drugs (Dietze et al 2005; Neira-León et al 2006).
Alcohol is a central nervous system depressant and drinking around the same time as using other central nervous system depressant drugs (e.g. opioids such as heroin, or benzodiazepines) increases the risk of fatal overdose from respiratory depression (Edwards et al 2017). Combining alcohol with central nervous system stimulants such as cocaine, methamphetamines and ecstasy also increases risk, with evidence that it can increase the risks of dehydration, cardiac arrhythmias and seizures (Althobaiti & Sari 2016).

**Medications that interact with alcohol**

Alcohol interacts with many other drugs, including prescription and over-the-counter medications, and herbal preparations. Alcohol can exert direct effects on the absorption of medications, change the way medications are metabolised (especially in the liver) or interfere with the effect of the medication at its site of action (Weathermon & Crabb 1999).

People taking medications (including herbal preparations) should check with their doctor or pharmacist about possible interactions between their medications and alcohol, and read any information on alcohol interactions included in the packaging. Temporary or permanent abstinence from alcohol may be necessary, particularly for people taking multiple medications.

The effects of combining alcohol with medications depend on the type and dosage of medication, the volume of alcohol consumed, and also on personal factors, such as genetics, gender and comorbid health conditions (Weathermon & Crabb 1999). Commonly prescribed classes of medications such as benzodiazepines, opiates, analgesics, antidepressants, anticonvulsants, antibiotics, antihistamines, anti-inflammatories, antipsychotics, and medications used to treat erectile dysfunction or diabetes have known interactions with alcohol and the combination can have serious side effects (Brunton et al 2006).

Taking prescription medications in a way other than prescribed, can have added risk of harms when combined with alcohol.
6. Guideline Two: Children and young people under 18 years of age

Guideline Two

To reduce the risk of injury and other harms to health, children and young people under 18 years of age should not drink alcohol.

Key messages

There is no clear ‘safe’ or ‘no-risk’ level of alcohol consumption for children and young people under 18 years. This is because of the increased risks of harm from alcohol for young people, including from injury and potential adverse effects on brain development.

Beginning alcohol use at an early age may also put young people at greater risk of longer-term alcohol-related harms, including alcohol use disorders that tend to appear later in life.

To minimise these risks children and young people under 18 years of age should not drink alcohol.

6.1 Rationale

Parents and carers often express concern about the drinking of young people, and feel they need to make decisions on whether or when to offer them alcohol. Young people themselves are interested to learn about or experience alcohol consumption.

This guideline provides guidance for parents, carers and young people themselves, about the safest option to prevent alcohol-related harm during the teenage years and later in adult life. It also provides evidence-based information for policy makers, clinicians, educators and others involved in young peoples’ lives.

Parents hear many mixed message about youth drinking. They are not often present when their teenage children start to socialise outside the family home and may be first exposed to alcohol, so they cannot advise their children at the time about the possible harms from drinking alcohol. This guideline aims to provide clear and unambiguous advice for parents to use when talking with their children about not drinking alcohol.

Alcohol use is a leading cause of premature death and morbidity among young Australians, largely because it increases the risk of injury, including alcohol poisoning (Chikritzhs et al 2004). Alcohol-related emergency department injury presentations are highest among Australian teenagers (15-19 year olds) compared with other age cohorts (Lensvelt et al 2015).

Recent evidence shows:

- 7.9% of young people aged 12–15 years and 43.8% of teenagers aged 16-17 years reported consuming at least one full serve of alcohol (defined as 1 standard drink) in the past 12 months (AIHW 2017).
- Around one-quarter of 16 year olds and one-third of 17 year olds reported drinking alcohol in the past week, with 9% of 16 year olds and 13% of 17 year olds drinking 5 or more standard drinks on one day in the past week (Guerin & White 2018).
• 38% of 12-17 year olds that drank on at least one day in the previous week intended to get drunk most or every time they drank (Guerin & White 2018).

• A friend or an acquaintance (48.1%) and parents (35.2%) were the most common source to supply teenagers with their first glass of alcohol (AIHW 2017).

Over time, the proportion of people aged between 12-17 years abstaining from alcohol has increased significantly from 54.3% in 2004 to 81.5% in 2016 and the average age at which young people first tried alcohol rose from 14.8 years (2004) to 16.1 years (2016) (AIHW 2017). The proportion of 16-17 year olds drinking 5 or more drinks on a single occasion over the previous thirty years also decreased from 20% in 1984 to 11% in 2017 (Guerin & White 2018).

Note: the above section sits as ‘drop down’ text underneath the guideline recommendation in the IT platform MAGICapp which is the principal guideline format. This section is designed to give the reader an understanding as to why the recommendation is important. Providing it in this secondary pdf format offers the reader an alternative guideline lay-out, but it detracts somewhat from the readability and flow of the guideline content.

6.2 Key info

Benefits and harms
There are substantial net benefits for children and young people under 18 years of age to not drink alcohol as advised by this Guideline, as opposed to drinking above this level.

Please see Guideline section ‘Practical Info’ for more details on the associations between alcohol consumption and mental health disorders in young people, as well as other important health outcomes.

Certainty of the Evidence
Part of the evidence supporting this recommendation comes from a systematic review evaluating the association between alcohol consumption and mental health disorders.

The quality of the evidence included in this systematic review varied across the critical outcomes. Due to the fact that GRADE rates epidemiological evidence typical of public health as low to very low, the certainty in the overall evidence was rated accordingly as very low.

Higher ‘quality’ study designs more typical for clinical practice guidelines – such as randomised control trials – are not appropriate for most public health interventions. **Well designed observational studies are often the best source of evidence on public health issues**, but they would be attributed a GRADE rating of low to very low.

Preference and values
It is expected that there is variation in how much young people and their parents/carers value minimising alcohol-related harm to young people.

It is expected that Australians value being able to make informed choices.
Resources and other considerations

There are expected costs associated with implementing this recommendation through health promotion and other policy activities. However it is expected that if children and young people do not consume alcohol (i.e. they align with this recommendation), there would be health-related savings by preventing short and long-term harm and therefore minimising the impact on the health system.

Equity

“Health equity is the notion that everyone should have a fair opportunity to attain their full health potential and that no one should be disadvantaged from achieving this potential if it can be avoided” (VicHealth 2015).

It is expected that health equity would be increased if this recommendation was implemented and adopted by young people and their parents/carers.

The recommendation should not create new health inequities or worsen any current inequities, but if it is not effectively implemented it misses the opportunity to reduce inequities. The messages need to reach those most vulnerable to alcohol related harm.

The information about the associations between alcohol consumption and outcomes for young people is detailed in the ‘Practical Info’ section. Drinking alcohol within the guideline recommendation aims to minimise the risk of alcohol-related harm for young people. In doing so, those young people currently disadvantaged by not being aware of these risks (and their parents/carers), will have a better chance of realising their full health potential. Of note, socioeconomic status does not determine whether an adolescent drinks or not.

Acceptability

As the recommendation is consistent with the previous 2009 recommendation, it is expected that it will be generally acceptable by most Australian parents/carers and young people. It is noted there may be varied acceptability amongst young people.

Feasibility

The recommendation is feasible considering it is consistent with the 2009 recommendation.

The success of the guidelines in improving health outcomes is entirely dependent on their successful dissemination, public communications and ongoing community awareness raising about the guidelines (including to health professionals), for which the Australian Government is responsible for.

Note: the above section sits as ‘drop down’ text underneath the guideline recommendation in the IT platform MAGICapp which is the principal guideline format. This section is designed to give the reader an understanding of the GRADE Evidence to Decision Framework. Providing it in this secondary pdf format offers the reader an alternative guideline lay-out, but it detracts somewhat from the readability and flow of the guideline content. The word ‘info’ is part of the MAGICapp template and is not a ‘typo’.
6.3 Why specific advice is needed for Australians under 18 years of age

Parents and carers often express concern about the drinking of young people, and feel they need to make decisions on whether or when to offer them alcohol. Young people themselves are interested to learn about or experience alcohol consumption.

This guideline provides guidance for parents, carers and young people themselves, about the safest option to prevent alcohol-related harm during the teenage years and later in adult life. It also provides evidence-based information for policy makers, clinicians, educators and others involved in young peoples’ lives.

Parents hear many mixed message about youth drinking. They are not often present when their teenage children start to socialise outside the family home and may be first exposed to alcohol, so they cannot advise their children at the time about the possible harms from drinking alcohol. This guideline aims to provide clear and unambiguous advice for parents to use when talking with their children about not drinking alcohol.

Alcohol use is a leading cause of premature death and morbidity among young Australians, largely because it increases the risk of injury, including alcohol poisoning (Chikritzhs et al 2004). Alcohol-related emergency department injury presentations are highest among Australian teenagers (15-19 year olds) compared with other age cohorts (Lensvelt e al 2015).

Recent evidence shows:

• 7.9% of young people aged 12–15 years and 43.8% of teenagers aged 16-17 years reported consuming at least one full serve of alcohol (defined as 1 standard drink) in the past 12 months (AIHW 2017).

• Around one-quarter of 16 year olds and one-third of 17 year olds reported drinking alcohol in the past week, with 9% of 16 year olds and 13% of 17 year olds drinking 5 or more standard drinks on one day in the past week (Guerin & White 2018).

• 38% of 12-17 year olds who drank on at least one day in the previous week intended to get drunk most or every time they drank (Guerin & White 2018).

• A friend or an acquaintance (48.1%) and parents (35.2%) were the most common source to supply teenagers with their first glass of alcohol (AIHW 2017).

Over time, the proportion of people aged between 12–17 years abstaining from alcohol has increased significantly from 54.3% in 2004 to 81.5% in 2016 and the average age at which young people first tried alcohol rose from 14.8 years (2004) to 16.1 years (2016) (AIHW 2017). The proportion of 16-17 year olds drinking 5 or more drinks on a single occasion over the previous thirty years also decreased from 20% in 1984 to 11% in 2017 (Guerin & White 2018).

Limitations of the evidence

There is strong evidence that alcohol can cause serious immediate harm, especially in young people aged less than 18, particularly injury, alcohol poisoning and death. However, often the research does not present the actual amount consumed.

While the data indicates that more young people are abstaining from alcohol consumption, the evidence indicates that those who are drinking are often drinking to intoxication. This drinking pattern, as well as the physiological characteristics of those under 18 years old, means that they are especially vulnerable to alcohol poisonings – including that requiring emergency department treatment – trauma and death due to alcohol consumption.

There is limited research on the impacts of young people drinking lower amounts of alcohol (e.g. 1-2 drinks intermittently or daily).
Why there is one recommendation for all adolescents under 18 years of age

The new guideline recommendation provides advice for all adolescents under 18 years of age, based on the following considerations:

• There is continuing clear evidence that the patterns of drinking and the physiology of people under 18 make them particularly vulnerable to the harms of alcohol.
• There is now more evidence about the impact of drinking on altered brain development in humans aged under 18.
• There is no specific evidence identifying separate risks for different age groups under 18 years of age.
• One guideline for all adolescents under 18 years of age was seen as providing a clear message, aligned with the current evidence.

The Expert Committee noted the harms of concern include injury, alcohol poisoning, risk-taking, altered brain development and the potential for establishing drinking patterns of concern later in life. The committee used the available and emerging evidence, and the precautionary principle that takes extra consideration of those more vulnerable members of our society, in advising on having one clear message that the risks and harms are lowest when adolescents under 18 years of age do not drink alcohol.

6.4 Scientific evidence

The three Guidelines and their key recommendations were informed by a comprehensive evaluation of the scientific evidence, including systematic reviews of the published research evidence and meta-analyses, which combine the findings of multiple studies. Systematic reviews use standardised criteria and an approach that can be replicated in the future. Meta-analyses synthesise findings from existing studies.

This Guideline Two was developed taking into account all the scientific evidence available. The Expert Committee used the evidence from one systematic review and from additional studies, to add to the information used to inform the previous (2009) guideline.

Systematic review

A systematic review was undertaken to fill evidence gaps for the association between alcohol consumption and mental health in young people. Studies examining the association between different levels and patterns of alcohol consumption and a range of mental health outcomes in young people under 18 years were considered in developing this guideline.

Additional evidence

To complement the systematic review referred to above, NHMRC made a public call for submissions of the evidence on the health risks and benefits of drinking alcohol. This public call for evidence helped identify relevant studies and gaps in the evidence, and identified areas of concern for the public and stakeholders. The public call had clear inclusion and exclusion criteria to ensure only studies of a reasonable quality were accepted (described in Appendix 2: Administrative Report). Given this call was not a formal systematic review, the submitted evidence could not be evaluated using the GRADE approach that was used for the systematic reviews (described in Appendix 2: Administrative Report). Instead, the evidence from the public call was considered along with the evidence from the systematic review and the 2009 NHMRC guideline to inform the explanatory text outlined in this guideline.
6.5 Risk of injury and harm

Young people are particularly vulnerable to the harmful effects of alcohol because of their developing body and brain and inexperience of the effects of drinking alcohol. These factors, combined with a greater likelihood of risk-taking behaviours, expose young people to a heightened risk of injury.

Physical injury

There is considerable evidence that alcohol use is a major risk factor for a range of teenage injuries. Much of the evidence is based on US populations where the minimum legal drinking age (i.e. 20 or 21 years) has been higher than in Australia for many decades. As a result, most studies include teenagers up to 19 years of age as they are considered ‘under-aged’ and few studies align precisely with the Australian legal purchase/drinking age of 18 years.

Sindelar et al (2004) reviewed 20 alcohol use and injury studies conducted in medical settings (e.g. emergency departments) that were focused on 13 to 19 year olds. Most studies used blood tests or medical records to distinguish between alcohol and non-alcohol-related attendances. The review found that teenagers who tested positive for alcohol when they presented for medical treatment were more likely to have had an injury, most often due to a road crash, assault or self-harm, than those who had not consumed alcohol. Alcohol-exposed, injured teenagers were also more likely to have incurred an injury considered to be of a serious nature (e.g. requiring a hospital stay) and to have been intentionally caused (e.g. arising from assault or self-inflicted) (Sindelar et al 2004).

Using systematic methods, Newbury-Birch et al (2009) undertook a wide ranging review of previously published reviews on alcohol use and its impacts on young people (15-19 years) for the then UK Department for Children, Schools and Families. They confirmed the Sindelar et al (2004) finding that young people who drink alcohol have higher risks of injury and added that “Adolescents and young people who drink drive, or allow themselves to be carried by a drink driver are more likely to be involved in a car accident.” (p.37).

In 2009, a very large cross-sectional study that included more than 22 million ED injury presentations among 13-20 year olds across 50 US states, described how alcohol-related injuries were distributed by individual ages. Alcohol-related visits increased with increasing age such that by age 16, frequency of presentation was triple that for a 14 year old. As noted by the authors, however, rather than increasing uniformly from year-to-year, spikes in risk were apparent at ages 16 and 18, coinciding with major teenage milestones such as gaining a vehicle licence (Linakis et al 2009).

In Australia, male and female teenage (15-19 years) alcohol-related ED injury rates were more than double that for the total population in 2012. Despite the fact that 15-17 year olds have restricted legal access to alcohol, teenage rates were also higher than for those aged in their twenties (Lensvelt et al 2015). A 2004 report based on data from mid-1990 to 2002 identified the top 5 causes of alcohol-related deaths specific to under-aged Australian drinkers (14-17 years). The leading cause of alcohol-related death was road injury, either while in a vehicle or as a pedestrian, and accounted for more than 50% of all alcohol-related deaths. Suicide, assault and drowning were also among the top five (Chikritzhs et al 2004). Although dated, these data concur with US findings and with recent Australian data highlighting injury as the main cause of premature death among 15-24 year olds (AIHW 2019).

Risky sexual behaviour

There is the increased likelihood of adolescent risky sexual behaviour when alcohol is involved (Coleman & Cater 2005). A study of Victorian high school students found that the likelihood of experiencing risky sex and regretted sex was increased by heavy episodic drinking (binge drinking) and by drinking in a manner that once started is difficult to stop (Agius et al 2013).
Mental health and self-harm

A review of 20 studies examined the association between heavy episodic drinking and depression. It found that for adolescents, heavy episodic drinking predicted increased levels of depressive symptoms. This association was found to be stronger in females than males (The University of Adelaide/Adelaide Health Technology Assessment 2018).

Adolescents who start drinking early may have various reasons to do so (e.g. childhood trauma, reduced adult supervision or risk-taking personality). These same predisposing factors may contribute to the adverse health outcomes from adolescent alcohol consumption, including self-harm, suicidal thoughts and death by suicide (Miller et al 2007). The Expert Committee advising on the guideline noted that alcohol-induced disinhibition is a risk factor for teenagers harming themselves if they have these thoughts.

Two large cross-sectional studies on adolescents reported that both heavy episodic drinking and drunkenness were linked with suicidal ideation and/or suicide attempt. One of these studies reported that ‘drinking while down’ (i.e. the motive for drinking) was a stronger predictor of suicide attempt than the drinking of alcohol itself (The University of Adelaide/Adelaide Health Technology Assessment 2018).

Alcohol-use disorders, in conjunction with major depression, represent an especially high-risk profile for adolescent suicidal behaviour and completed suicide (Sher 2006). In addition, adolescents with alcohol-use disorders tend to complete suicide at a greater rate than those without alcohol problems (Sher 2006). It has been suggested that adolescents who use drinking as a method of coping are more likely to suffer from depression, precipitating heavy drinking, which is itself predictive of suicidal behaviour (Windle 2004).

Effect on brain development and cognition

Adolescence is a time of significant neurodevelopment, with key brain regions (e.g. prefrontal cortex, limbic system and cerebellum) identified as particularly vulnerable to the effects of alcohol during this period (Squeglia et al 2009 and Spear 2018). Adolescents who engage in heavy drinking have been found to have alterations in both grey and white matter (e.g. smaller/thinner cortical and subcortical structures and decreased white matter integrity), abnormalities in brain activity (Squeglia et al 2014 Cservenka & Brumback 2017) and altered brain growth trajectories (Pfefferbaum et al 2018). These alterations in brain structure and function are likely to be related to findings of poorer neurocognitive performance on tests of attention, working memory, spatial functioning, verbal and visual memory, and executive functioning in heavy drinking adolescents (Jacobus & Tapert 2013).

6.6 Age of first drinking and longer-term outcomes

As noted above, exposure to alcohol under the age of 18 is related to a number of immediate harms and is also likely to adversely affect the developing brain. In addition to this, recent reviews of the evidence have indicated that early-onset alcohol use (generally under the age of 18) is likely to be a risk factor for a range of longer-term health outcomes in adulthood. These outcomes include a greater risk of heavy drinking, alcohol use disorders including dependence, road accidents involving alcohol, anxiety, depression and drug-related problems (Hermos, Winter, Heeren & Hingson 2008; Hingson, Heeren & Edwards, 2008; McCambridge et al 2011).

However, these reviews also indicated that the overall quality of studies to date was low, that the evidence was somewhat mixed and that there is a need for more evidence from well designed, long-term cohort studies before it can be concluded that alcohol is definitely causing these outcomes. The importance of accounting for the characteristics of people who tend to drink at early ages, such as socioeconomic status or family history has been noted (Maimaris and McCambridge 2014; Marshall, 2014).
At the same time as acknowledging these limitations, a narrative review (Marshall 2014), relating primarily to alcohol consumption for people under the age of 18, points out that, heavy alcohol consumption in late adolescence appears to persist into adulthood and is associated with alcohol problems, including dependence, premature death and diminished work capacity. Early identification of adolescent risk factors may be helpful in preventing and/or attenuating risk’ (p.160).

6.7 Practical info

There is no clear ‘safe’ or ‘no-risk’ level of drinking alcohol for children and young people under 18 years due to the increased risk of injury, the risk of adversely affecting brain development and the risk of alcohol-related harm later in life. To reduce these risks children and young people under 18 years of age should not drink alcohol.

However if young people choose to drink despite this guidance then it is recommended that:

- They should speak to their parents/guardians/carers about drinking.
- They should do so in a safe environment and under parental guidance.
- Should only drink at a low level (e.g. never more than one standard drink per day).

This guideline does not advocate that young people drink or that adults provide them with alcohol. Drinking to intoxication is particularly risky for this age group.

Serving drinks to young people under the age of 18 years by parents, carers or other adults may be subject to legislation.

Note: this is a section that sits as ‘drop down’ text underneath the guideline recommendation in the IT platform MAGICapp. This section is designed to give the reader some practical information relevant to the recommendation and the rest of the guideline, and may be important for implementing the guideline and consumer messaging. Providing it in this secondary pdf format offers the reader an alternative guideline lay-out, but it detracts somewhat from the readability and flow of the guideline content.
7. Guideline Three: Pregnancy and breastfeeding

Guideline Three

A. To reduce the risk of harm to their unborn child, women who are pregnant or planning a pregnancy should not drink alcohol.

B. For women who are breastfeeding, not drinking alcohol is safest for their baby.

Key messages

This Guideline is based on evidence of the potential harms for the developing fetus and for young babies when mothers drink alcohol whilst pregnant or breastfeeding.

The evidence does not indicate a safe amount of alcohol that pregnant women and breastfeeding mothers can drink. As there is a risk of harm to the fetus, these guidelines take a precautionary approach and recommend not drinking alcohol when pregnant.

For Pregnancy

- Alcohol is a teratogen which can cause permanent harm to the developing fetus.
- The central nervous system starts developing very early in the pregnancy, and the brain remains sensitive to the harms from alcohol throughout pregnancy.
- No safe level of alcohol consumption during pregnancy has been identified.
- The risk of harm to the fetus increases the more the mother drinks and the more frequently she drinks.
- A variety of maternal and fetal factors can play a role in determining the risks from drinking alcohol while pregnant (e.g. genetic differences, metabolic rates, biochemical and inflammatory responses to alcohol). These factors make it difficult to predict the level of risk in each individual pregnancy.
- Avoiding drinking alcohol during pregnancy prevents risk of harm to the developing fetus.

For Breastfeeding

- For women who are breastfeeding, not drinking alcohol is safest for their baby.

Maternal alcohol consumption may adversely affect feeding behaviour and sleep patterns of the breastfed baby. Australian and international infant feeding guidelines recommend exclusive breastfeeding for the first six months and then continued breastfeeding while solid foods are introduced until the infant is one year old (NHMRC 2012). It is important that breastfeeding women know that not drinking alcohol is safest for their baby.
7.1 Rationale

When a woman drinks alcohol during pregnancy (including before she knew she was pregnant) and/or while breastfeeding, the developing fetus/baby is at risk of harm. Australian women vary in their levels and patterns of alcohol consumption during pregnancy and while breastfeeding.

In 2016, most women (55.6%) abstained from alcohol when pregnant; this increased from 40% in 2007 (Australian Institute of Health and Welfare 2017). Despite the increase in the proportion of women abstaining from alcohol, more than one third of women (34.7%) reported drinking alcohol when pregnant. However, once women found out they were pregnant, many reduced their alcohol consumption. Of those who did drink alcohol during their pregnancy, 48.7% consumed alcohol before they knew they were pregnant and 25.2% consumed alcohol after they knew they were pregnant (Australian Institute of Health and Welfare 2017).

Among those who drank alcohol while pregnant, 81% consumed alcohol monthly or less and 16.2% consumed alcohol 2 to 4 times a month. When drinking, most women (97.3%) consumed between 1-2 standard drinks.

A similar trend for breastfeeding women was seen, with 41.9% of breastfeeding women abstaining from alcohol in 2016, compared with 25.0% abstaining in 2007.

7.2 Key info

**Benefits and harms**

There are substantial net benefits in not drinking alcohol as advised by this Guideline when pregnant and whilst breastfeeding, as opposed to drinking anything.

A more precautionary approach has been taken for these recommendations than for Guideline 1 because of the potential for lifelong harm for babies.

Please see Guideline section ‘Practical Information’ for more details on the associations between maternal alcohol consumption during pregnancy and whilst breastfeeding and various health outcomes.

**Certainty of the Evidence**

Part of the evidence supporting this recommendation comes from a systematic review of systematic reviews evaluating the evidence on the health effects of alcohol consumption during pregnancy and while breastfeeding in relation to the following health conditions:

- Preterm birth
- Low birth weight
- Small for gestational age
- Child motor function
- Developmental delay, communication (language) delay, communication development
A systematic review evaluating the association between alcohol consumption during pregnancy and adverse pregnancy outcomes, or birth defects and behavioural problems in babies and children; and a systematic review of the association between alcohol consumption whilst breastfeeding and selected outcomes contributed to the evidence base for this recommendation.

The quality of the evidence included in these systematic reviews varied across the critical outcomes. Due to the fact that GRADE rates epidemiological evidence typical of public health as low to very low, the certainty in the overall evidence was rated accordingly as very low.

Higher ‘quality’ study designs more typical for clinical practice guidelines – such as randomised control trials – are not appropriate for most public health research. **Well designed observational studies are often the best source of evidence on public health issues**, but they would be attributed a GRADE rating of low to very low.

**Preference and values**

It is expected that most Australian women who are pregnant, might become pregnant or are breastfeeding (and men/women as fathers/co-parents) would value minimising harm to fetuses and babies in the context of alcohol consumption.

It is expected that Australians value being able to make informed choices.

**Resources and other considerations**

It is expected that if Australian women who are pregnant, might become pregnant or are breastfeeding do not consume alcohol in line with these recommendations, there would be:

1. **health and health system savings due to:**
   - Reduced hospital admissions caused by alcohol-related harm to the fetus, baby or child.
   - Reduced visits to allied health and medical professionals about alcohol-related harm to the fetus, baby or child (for example to diagnose and manage infants and children with Fetal Alcohol Syndrome Disorder (FASD)).
   - Reduced impact on other areas of the health system related to this issue.

2. **savings for the early intervention and education sector due to a reduced need for services to work with infants and children with FASD. FASD rates in Australia have been reported at 0.01 to 0.68 per 1000 births in the total population however, this is considered to be an underestimate (Burns et al. 2013).**

3. **savings for the criminal justice sector, given research evidence indicating over-representation of children with more severe FASD (Bower et al. 2018).**
Draft Australian Guidelines to Reduce Health Risks from Drinking Alcohol

Equity

“Health equity is the notion that everyone should have a fair opportunity to attain their full health potential and that no one should be disadvantaged from achieving this potential if it can be avoided” [143] (VicHealth 2015).

It is expected that health equity would be increased if these recommendations were implemented and adopted by Australian women who are pregnant, planning pregnancy or breastfeeding.

The recommendations cannot create health inequities, however effective implementation is critical to address health inequities.

The information about the associations between maternal alcohol consumption and certain infant outcomes are detailed in the ‘Practical Information’ section. Drinking alcohol within the guideline recommendation would minimise the risk of alcohol-related harm for all infants and children. In doing so, those currently disadvantaged by not being aware of these risks to the unborn child will give their unborn child a better chance of realising their full health potential.

Acceptability

As the recommendations are consistent with the 2009 recommendations, it is expected that these will also be generally acceptable to Australian women who are pregnant, planning pregnancy or breastfeeding (and men/women as fathers/co-parents).

Feasibility

The recommendations are considered feasible to implement given they are consistent with the 2009 recommendations.

The success of the guidelines in improving health outcomes is entirely dependent on their successful dissemination, public communications and ongoing community awareness raising about the guidelines (including to health professionals), for which the Australian Government is responsible.

7.3 Pregnancy

Guideline 3A is based on systematic reviews of the literature. The existing evidence does not identify a safe amount of alcohol that pregnant women can drink. As there is risk of lifelong harm to the unborn child, this guideline takes a precautionary approach and recommends not drinking alcohol when pregnant.

Alcohol is a teratogen (an agent that causes abnormalities) that crosses the placenta resulting in the fetus being exposed to the same, or higher, alcohol concentration as the mother.

Maternal alcohol consumption can harm the fetus in a number of ways and the type and severity of harm depends on how much alcohol the pregnant woman drinks, the pattern of drinking, and the stage of pregnancy when the drinking occurs (Figure 7.3). Alcohol exposure at any stage during pregnancy (including before pregnancy is confirmed) can have consequences for the developing fetus (Bower and Elliott 2016).
The evidence shows that the risk of harm to the fetus increases the more alcohol the mother consumes and the more frequently she drinks. However, the exact level at which maternal alcohol consumption begins to harm the fetus is not known, and a ‘safe’ level of alcohol exposure has not been identified. While the risk of harm to the fetus from low levels of alcohol (e.g. less than 1 standard drink per day) is likely to be low, there is not enough evidence to accurately estimate the level of risk from small amounts of alcohol.

A variety of maternal and fetal factors can play a role in determining the risks from drinking alcohol while pregnant (e.g. genetic factors, metabolic rates, maternal diet and the woman’s biochemical and inflammatory responses to alcohol). Genetics plays a role in determining the effects of alcohol on the developing fetus, with some genotypes conferring increased risk of harm and others providing protection (Jacobson et al 2006). Maternal and fetal metabolic rates, their risk of reacting adversely to alcohol breakdown products, and their biochemical and inflammatory responses to alcohol at a cellular level are all influenced by genetic factors. There is likely to be substantial variation in risk factors among mothers and babies, making it difficult to predict the level of risk from alcohol in each individual pregnancy (Bower and Elliott 2016).

A pregnant woman’s partner’s drinking has also been shown to impact on the pregnant woman’s alcohol consumption (McBride and Johnson 2016).

Ceasing alcohol consumption will provide the best start to health for the developing baby. If women are concerned or experience difficulty ceasing, it is recommended that they speak to their health professional.

Avoiding alcohol during pregnancy prevents risk to the fetus. Women who have consumed alcohol during pregnancy should be advised to stop drinking alcohol as this will prevent further risk to the fetus. Pregnant women who find it difficult to stop drinking alcohol should be offered support and be referred to appropriate services (Poole et al 2016).
7.3.1 Scientific evidence

These Guidelines are informed by a comprehensive evaluation of the evidence drawing on systematic reviews and meta-analyses. Systematic reviews are reviews of the literature conducted using standardised criteria and an approach that can be replicated into the future. Meta-analyses synthesise findings from existing studies. Guideline Three uses the evidence from systematic reviews and additional studies, adding to the information from the 2009 NHMRC Alcohol Guideline.

Systematic reviews

An overview of systematic reviews was completed to consider the short-term and long-term health risks and benefits associated with alcohol exposure (drinking alcohol). This review included 38 systematic reviews for 53 health outcomes including the specific pregnancy health outcomes of preterm birth, low birthweight, small for gestational age, child motor function and communication delay.

A systematic review was undertaken to fill evidence gaps for the association between maternal alcohol consumption and pregnancy outcomes, specifically birth defects and behavioural problems in babies and young children. The systematic review reported on 21 studies for birth defect outcomes and four studies for behavioural outcomes.

Additional evidence

To complement the systematic reviews referred to above, NHMRC made a public call for submissions of the evidence on the health risks and benefits of women drinking alcohol during pregnancy. The public call had clear inclusion and exclusion criteria to ensure only studies of a reasonable quality were accepted (described in Appendix 2: Administrative Report). Given this call was not a formal systematic review, the submitted evidence could not be evaluated using the GRADE approach that was used for the systematic reviews. Instead, the evidence from the public call was considered along with the evidence from the systematic reviews and the 2009 NHMRC Alcohol Guideline to inform the narrative text for this Guideline.

7.3.2 Adverse effects of maternal alcohol consumption at different life stages

Fetal, neonatal and early childhood outcomes

There is evidence from a meta-analysis of studies that examined maternal alcohol consumption and risks of preterm birth, low birth weight and the infant being small for its gestational age (SGA) that these risks increase with consumption and are similar across the trimesters (Patra et al 2011). Risks of low birth weight and SGA increase as the mother’s alcohol intake increases, beginning at an average of just over 10 grams of alcohol a day (about one standard drink). For preterm birth, risk also increases as maternal alcohol consumption increases, starting from approximately 18 grams per day.

This concurs with an earlier review by Henderson el al (2007). However, this systematic review pointed out that in relation to low levels of consumption, studies in this area suffered many limitations such as failing to account for alcohol drinking patterns [e.g. heavy episodic drinking (5+ standards drinks) versus regular consumption] and produced inconsistent results. This led them to conclude that on the basis of (then) current evidence, it was not possible to determine whether drinking alcohol at low levels during pregnancy (i.e. defined as less than one standard drink a day) was safe. Along similar lines, Australian researchers have argued that timing and intensity of maternal alcohol intake has rarely been adequately considered by past studies and this may have masked substantial prenatal effects, particularly harms caused to the fetus by heavy episodic drinking (O’Leary et al 2010).

There is very clear evidence that heavy drinking is harmful to the developing fetus. For example, an Australian study that used alcohol diagnosis in health records as a proxy for heavy consumption among pregnant women in a population-based cohort study found a significantly greater risk of poor pregnancy outcomes including SGA, preterm delivery and
low Apgar scores among babies from women with an alcohol diagnosis (heavy drinkers) when compared with mothers who did not have an alcohol diagnosis (Srikartika and O’Leary 2014).

A meta-analysis of studies examining maternal alcohol consumption and birth defects was possible for the outcomes of cleft lip, cleft palate and spina bifida. The meta-analysis did not show a link between the level and pattern of maternal alcohol consumption in the first trimester and these birth defect outcomes (Cochrane Australia and SAHMRI 2018). A number of single studies that assessed a range of other birth defects found no reliable evidence of a link between drinking alcohol and neural tube defects or heart defects. However, increased rates of cryptorchidism (undescended testes), neural tube defects, and two abnormalities of abdominal development (gastrochisis and omphalocele) were reported in a single study. In contrast, one study reported decreased rates of congenital limb deficiencies, spina bifida and strabismus following alcohol exposure in pregnancy.

The US Institute of Medicine has classified a range of birth defects as alcohol-related birth defects (ARBD). These ARBD are relatively rare and may also be caused by other factors. As such, future research studies examining the risk of birth defects from fetal alcohol exposure need to have a large number of participants.

An Australian data-linkage study that used ‘alcohol diagnosis’ included in health records to identify women drinking heavily during pregnancy examined the risk of birth defects in their children (O’Leary et al 2013). The study identified an increased risk of heart defects, kidney defects, skeletal abnormalities and microcephaly (small head and brain) when the mother had an alcohol diagnosis recorded during pregnancy.

Fetal Alcohol Spectrum Disorder

The Australian Guide to the Diagnosis of Fetal Alcohol Spectrum Disorder (FASD) refers to FASD as the umbrella term for the spectrum of adverse effects that can be seen in infants, children and adolescents exposed to a range of amounts of alcohol during pregnancy (Bower and Elliott 2016). These can include lifelong physical, cognitive, behavioural and neurodevelopmental abnormalities, and restricted growth. The level and nature of the conditions can be related to the amount consumed and the developmental stage of the fetus.

Health professionals in Australia are often unaware of the FASD diagnostic criteria and do not routinely ask pregnant women about their alcohol use, so FASD often goes undiagnosed (Bower and Elliott 2016). FASD is seldom diagnosed at birth and the developmental problems are often noticed at school, when learning and behavioural difficulties become more evident (NOFASD 2019). People with FASD experience increased rates of mental illness, drug and alcohol problems and trouble with the law (Streissguth et al 2004).

The diagnosis of FASD requires evidence of prenatal alcohol exposure and severe impairment in three or more domains of central nervous system structure or function. A diagnosis of FASD can be divided into one of two sub-categories: (i) FASD with three sentinel facial features or (ii) FASD with less than three sentinel facial features. For further information see the Australian Guide to the Diagnosis of FASD (Bower and Elliot 2016).

Developmental delay and behavioural problems

Evidence from the following systematic reviews suggest that drinking high levels of alcohol during pregnancy may increase the risk of the child having poorer gross motor skills, but did not find evidence indicating a negative impact of alcohol exposure on language development or some behavioural outcomes:

- Bay (2011): reported that maternal drinking of alcohol at more than 4 drinks per day (where one drink was defined as 12 grams of alcohol), increased the risk of poor gross motor skills for the child. Drinking between 10 and 30 alcoholic drinks per week showed inconsistent results making it difficult to determine whether there are any effects at this level of alcohol consumption. This review looked at 23 case control and cohort studies. Interpretation of the results is limited by the fact that the included studies used different scales to measure child motor function.
• A review of three cohort studies reported no statistically significant effect of low to moderate maternal alcohol consumption (defined as an average of less than 10 grams [one standard drink] per day or 70 grams per week during pregnancy) and the child’s language development measured between one and three years (O’Keeffe et al 2014).

• Cochrane Australia and SAHMRI (2018) systematic review of four cohort studies found:
  – A limited association between one or more ‘binge’ episodes (more than five drinks on one occasion) a week in weeks 0–6 of pregnancy and worse behavioural outcomes in infants (difficult temperament, sleeping problems and being demanding and/or irritable).
  – No reliable evidence of an association for these outcomes with the same amount of alcohol consumed less than once a week in weeks 0–6 of pregnancy.
  – No reliable evidence of associations between alcohol consumption (in the first trimester or throughout pregnancy) and conduct problems and hyperactivity in children at three to four years of age.

Other studies have documented neurological effects from maternal alcohol consumption, including reduction in nerve-conduction velocity and amplitude in children (de los Angeles Avaria et al 2004); a dose-dependent decrease in visual acuity in infants (Carter et al 2005); and a dose-dependent reduction in the size of the frontal cortex (but not of other brain structures) at levels of two to six standard drinks per day (Wass et al 2001). This latter finding is consistent with impairment of executive function, working memory and attention observed in children with FASD.

**Childhood and adolescence**

There are few published evidence reviews on the effect of varying amounts of maternal alcohol consumption on children and adolescents. Outcomes of interest for these young people would include growth, educational achievement, future drug and alcohol dependence, mental health outcomes, impact on later employment and any problems with the law. Limitations of undertaking such research include difficulties in accurately documenting the quantity, timing and frequency of alcohol intake in pregnancy, and the difficulty in accounting for factors that could interfere with the results (potential ‘confounding factors’). Single studies reported in the 2009 NHMRC Guideline indicate the following about some of these outcomes of interest:

**Growth**

A single study on adolescents aged 14 years, whose mothers drank an average of three or more drinks per week in the first trimester, showed a decreased weight, height, head circumference and skin-fold thickness compared with children of mothers who did not drink alcohol or drank at a lower level (Day et al 2002). The authors observed a dose-response relationship between growth deficit and prenatal alcohol exposure with effects on growth on children at 14 years of age detectable at intakes of less than one drink per day on average; effects were most marked with exposure in the first trimester.

**Educational achievement and cognitive abilities**

• Compared with children of mothers who did not drink alcohol while pregnant, children who were exposed to alcohol in utero because their mother drank an average of more than 1.4 standard drinks per day, had deficits at 7.5 years of age in ‘working memory and executive function’ (the set of processes to manage oneself in order to achieve a goal). This effect increased with increasing alcohol consumption and was most marked for numeracy tasks and persisted after controlling for IQ. These effects were more noticeable in children born to mothers aged over 30. The same children did not have deficits in impulse control or their ability to pay attention for sustained periods of time (Burden et al 2005a, Burden et al 2005b).

• Ten-year-old children of mothers who drank three or more drinks per week while pregnant showed significant negative effects on their verbal and non-verbal learning and memory score (Richardson et al 2002). These children were tested again at age 14 (Willford et al 2004) when deficits were found in the verbal domain of learning and short/long term
memory. In both age groups, problems with learning and memory were seen even when the mother drank less than 4.2 standard drinks per week.

- 14-year-old adolescent children of mothers who drank an average of one standard drink per day in early pregnancy showed no detectable effect on intellectual ability, learning and attention (O’Callaghan et al 2007). They showed decreased cognitive ability if their mother drank more than five drinks on one or more occasions. There was a linear relationship between the frequency of heavy maternal consumption of alcohol and the later cognitive ability of the child.

- A study of pregnant women from lower socioeconomic backgrounds who drank less than one drink per day on average in the first and second trimesters, indicated a link between low-to-moderate prenatal alcohol exposure and poor overall school performance at 10 years of age (Goldschmidt et al 2004). Deficits in reading comprehension and teachers’ rating of poor school performance were significantly associated with maternal consumption of four or more alcoholic drinks per occasion in the second-trimester.

Social interactions and/or problems with the law

- Children aged 6–7 years with any prenatal alcohol exposure scored higher for externalising (aggression, delinquency) and internalising (anxiety, depression, withdrawal) behaviours (Sood et al 2001). This effect was present after adjusting for other factors that might affect the results (confounders). The chances of the child displaying delinquent behaviour were significantly higher in children whose mothers drank any alcohol, compared with children whose mothers did not drink. These adverse effects on behaviour were dose-related and were evident at low average levels of drinking (an average of 0.6 standard drinks per day).

Adulthood

There are few studies examining outcomes from prenatal alcohol exposure in adults. It is acknowledged that outcomes (e.g. physical coordination and gross motor skills) affected by prenatal alcohol exposure such as FASD can last into adulthood (Connor et al 2006). Impaired fetal growth such as being small for gestational age can have adverse effects over the long term.

7.4 Breastfeeding

The evidence does not identify a ‘safe’ or ‘no-risk’ level of alcohol that breastfeeding women can drink. This guideline takes a precautionary approach and recommends that for breastfeeding women not drinking alcohol is the safest option for their baby.

Alcohol and breast milk

Alcohol easily crosses into human breast milk. Because of this, breast milk has the same concentration of alcohol in it as the mother’s blood within an hour (Giglia and Binns 2006). At moderate to high levels of maternal drinking, the alcohol concentration in breastmilk can be even higher than that in the mother’s blood (Lawton 1985). It takes about two hours from the start of drinking to clear one standard drink of alcohol from human milk for an average woman. Human milk is only free of alcohol once the mother’s blood alcohol has gone back to zero. Expressing or ‘pumping and dumping’ does not speed up the process, or lower the alcohol concentration in the remaining milk (Giglia and Binns 2006).

The context of breastfeeding in Australia

Australian and international guidelines recommend exclusive breastfeeding of babies for the first six months, and then continued breastfeeding while solid foods are introduced and until twelve months of age (NHMRC 2012).
The 2010 Australian National Infant Feeding Survey (AIHW 2011) indicated that 96% of Australian mothers start breastfeeding. The 2017/18 National Health Survey (ABS 2018) reported almost 62% of infants are exclusively breastfed at age four months, and by 12 months 28% of children were still being breastfed (AIFS 2008).

Few Australian studies have reported on the prevalence and patterns of alcohol consumption while breastfeeding. However, available studies have indicated that many women who abstain from alcohol during pregnancy resume drinking alcohol after giving birth (Tay et al 2017; Tearne et al 2017), with most drinking alcohol at low levels and infrequently (Giglia 2010). The limited data on alcohol use while breastfeeding suggest that many women who drink while breastfeeding in Australia employ strategies (e.g. timing of alcohol use) to minimise alcohol exposure to their infants (Giglia 2010; Tay et al 2017; Tearne et al 2017).

7.4.1 Scientific evidence

This guideline uses the evidence from a systematic review and additional studies to add to the information in the previous guideline.

Systematic review

A systematic review was undertaken to fill evidence gaps for the association between maternal alcohol consumption and breastfeeding outcomes. The systematic review reported on one study on sedation in breastfed babies.

Additional evidence

To complement the systematic review referred to above, NHMRC made a public call for submissions of the evidence on the health risks and benefits of drinking alcohol during breastfeeding. The public call had clear inclusion and exclusion criteria to ensure only studies of a reasonable quality were accepted (see Appendix 2 Administrative Report). Given this call was not a formal systematic review, the submitted evidence could not be evaluated using the GRADE approach that was used for the systematic reviews. Instead, the evidence from the public call was considered along with the evidence from the systematic reviews and the 2009 NHMRC Alcohol Guideline to inform the narrative text for this guideline.

7.4.2 The impact of alcohol on breastfeeding and the infant

There is a lack of good quality evidence on the effect of maternal alcohol consumption while breastfeeding on babies’ breastfeeding, interaction and behaviour, and all areas of development. There is, however, considerable evidence regarding the effect of alcohol in breast milk on infant sleep.

Even at low maternal alcohol consumption, alcohol can adversely affect sleep-wake patterns of breastfed infants. Although the mechanism has not yet been identified, it is well established that small amounts of alcohol (e.g. less than 0.3 grams per kg), have a measurable effect on sleep patterns and an infant’s ‘ability to modulate behaviours’ (Giglia and Binns 2006, pp. 110).

A review by Giglia and Binns (2006) reported that drinking two standard drinks of alcohol or more per day whilst breastfeeding was associated with:

- Decreased ability to successfully breastfeed (decreased milk production by the mother and decreased milk consumption by the baby).
- Stopping breastfeeding earlier.
- Deficits in infant psychomotor development.
- Disrupted infant sleep-wake behavioural patterns.
In contrast, a relatively recent study by Tay et al (2017) reported that babies did not show any negative effects on breastfeeding duration, infant-feeding, or sleeping behaviour when their mothers consumed low levels of alcohol (defined as 14 or fewer standard drinks per week and fewer than 3 standard drinks per occasion) and used strategies to minimise their baby ingesting any alcohol through breast milk. These effects were tested at 2 and 12 months of age. As mothers self-reported their alcohol use at 8 weeks for the first two months after the baby was born and after the behaviour problems had occurred, there was the potential for reporting bias.

There is also evidence from Australia and overseas suggesting an association between heavy alcohol use in the postpartum period, and sudden infant death syndrome (SIDS), as well as infant mortality that is not diagnosed as SIDS (O’Leary 2013).

7.5 Practical info

A. Pregnancy

There is clear evidence that the risk of harm to the fetus increases the more alcohol the mother drinks while pregnant and the more frequently she drinks.

**As the evidence is unable to advise on a clear threshold, below which drinking alcohol in pregnancy is safe, it is recommended not to drink alcohol at all when pregnant.**

Women who are pregnant or planning a pregnancy should be advised that:

- Alcohol is a teratogen which can cause permanent harm to the developing fetus.
- The greater the quantity of alcohol the pregnant women drinks and the more frequently she drinks the greater the risk to the baby.
- While the risk of harm to the fetus from low levels of alcohol is likely to be low (less than 1 standard drink per day), no safe level of alcohol has been identified.
- It is difficult to determine for any one pregnancy how individual characteristics of the mother and fetus affect the level of risk for the unborn child from their mother drinking alcohol while pregnant.

As 50% of pregnancies are unplanned (Marie Stopes International Australia 2008), many fetuses will be unintentionally exposed to alcohol. Of note:

- This does not necessarily mean the fetus will be harmed. There are individual maternal and fetal factors including genetics, metabolic rates, biochemical and inflammatory responses to alcohol that influence the risk.
- This Guideline recommends pregnant woman to stop drinking alcohol (with medical support if withdrawal is expected) as this is good for the health of the developing fetus.
- Women should seek specialist medical advice if they are concerned about their pregnancy or the health of their baby because they have been drinking alcohol in pregnancy.

Note: this is a section that sits as ‘drop down’ text underneath the guideline recommendation in the IT platform MAGICapp. This section is designed to give the reader some practical information relevant to the recommendation and the rest of the guideline, and may be important for implementing the guideline and consumer messaging. Providing it in this secondary pdf format offers the reader an alternative guideline lay-out, but it detracts somewhat from the readability and flow of the guideline content.
B. Breastfeeding

Breastfeeding mothers should be advised that:

• This Guideline recommends that for breastfeeding women, not drinking is safest for the baby.

• The concentration of alcohol in the mother’s blood is essentially the same as the concentration in the breastmilk and only time will reduce the alcohol level (see Table 5).

• If a woman decides to drink alcohol whilst breastfeeding, she can plan ahead. This can allow her to express milk prior to drinking alcohol so that she has some alcohol-free milk to give the baby after drinking.

• Expressing breast milk after drinking alcohol and discarding it does not reduce the level of alcohol in the remaining breast milk.

• Breastmilk will be free of alcohol once the mother’s blood alcohol has returned to zero.

• If the woman chooses to drink whilst breastfeeding, seek professional advice to prevent the baby being exposed to alcohol.

Table 5 shows the estimated length of time after drinking alcohol before a zero level of alcohol will be reached in the breast milk of an average woman of a given bodyweight (Ho et al 2001). It should be noted that the actual time will vary for each individual woman.

Table 5. Time taken for alcohol to clear from breast milk (hours: minutes)

<table>
<thead>
<tr>
<th>Maternal weight (kg)</th>
<th>Australian standard drinks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>59</td>
<td>1:42</td>
</tr>
</tbody>
</table>

Note: Time is calculated from the beginning of drinking. Assumptions made: alcohol metabolism is constant at 15 mg/dL/hour; height of the women is 162.56 centimetres.

Source: Giglia & Binns 2006 (adapted from Ho et al 2001).
Appendix 1: Drinking frequency

There are no reliable published data providing fine-grained national estimates of how often Australian alcohol drinkers consume alcohol. For example, the published report for the National Drug Strategy Household Survey (AIHW 2017) provides only broad categories (e.g. daily, weekly, less than weekly). To inform our interpretation of the statistical modelling of the health impacts of various patterns of drinking, we required an estimate of the average number of days per week that Australian’s who drank, consume alcohol. We have conducted a series of analyses to provide a range of estimates.

National Health Survey (NHS)

We started by analysing data from the 2014/15 NHS conducted by the Australia Bureau of Statistics (2016). This survey collects data on drinking frequency using a simple broad question: ‘How often did you have an alcoholic drink of any kind in the last 12 months?’. The response options are provided below in Table 8.1. Each of these responses is converted into an annual number of drinking occasions by using the mid-point of the frequency range – for example, someone who reports drinking 5-6 days per week is estimated to have 286 (5.5 x 52) drinking occasions per year. These estimated drinking occasions are also provided in Table 8.1.

Table 8.1. Drinking frequency response items and implied annual drinking occasions, National Health Survey 2014/15.

<table>
<thead>
<tr>
<th>Response categories for alcohol frequency item</th>
<th>Implied annual drinking occasions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every day</td>
<td>365</td>
</tr>
<tr>
<td>5 to 6 days per week</td>
<td>286</td>
</tr>
<tr>
<td>3 to 4 days per week</td>
<td>182</td>
</tr>
<tr>
<td>1 to 2 days per week</td>
<td>78</td>
</tr>
<tr>
<td>2-3 days per month</td>
<td>30 (2.5 x 12)</td>
</tr>
<tr>
<td>About 1 day per month</td>
<td>12</td>
</tr>
<tr>
<td>Less often than 1 day per month</td>
<td>6</td>
</tr>
</tbody>
</table>

Each respondent was assigned an annual number of drinking occasions based on their response to the broad single drinking frequency question. These were transformed to weekly frequencies by dividing by 52, resulting in an estimated population average of 2.03 drinking occasions per week (excluding non-drinkers and non-responders).

National Drug Strategy Household Survey (NDSHS)

We conducted similar analyses using data from the 2016 NDSHS (AIHW 2017). Again, we started with the broad single question on drinking frequency. This question is worded exactly the same as the previously described NHS question and uses the same response categories. Again, non-drinkers and non-responders were excluded. Using these data, a population average of 2.06 drinking days per week was estimated.

Both estimates are broadly consistent with an average of 2 drinking occasions per week. However, it is well established in alcohol survey research that simple broad questions like these lead to significant under-reporting of drinking practices (via recall bias and other issues consistent with self-reported data). In general, the more questions you ask a respondent about their drinking habits, the more reliable the responses you receive (Gmel 2004).

For that reason, we conducted a further set of analyses using the graduated frequency questions in the NDSHS. These items ask respondents to report how often they drank various amounts of alcohol (e.g. “how often in the past 12 months did you drink 1-2 standard drinks in a day” etc for 7 different levels of drinking). These more detailed questions elicit a better overall estimate of population drinking (Stockwell et al 2004).
We took the same approach as described above – frequencies of drinking at each level were converted into an annual number of drinking occasions based on the mid-points of the frequency categories. The total number of drinking occasions were then then calculated across the seven drinking levels to provide an overall number of drinking occasions.

Respondents who accidentally provided responses that led to more than 365 drinking occasions per year were capped at 365 (e.g. a respondent might say that they drank 1-2 drinks 5-6 days per week and 3-4 drinks 3-4 days per week, which would lead to an estimate of 468 drinking occasions per year – see (Greenfield 2000) for more details of this method).

Again, annual frequencies were converted to weekly frequencies and the population mean estimates were calculated, with non-drinkers and non-responders excluded. Using this approach we estimated that on average, Australian drinkers consume alcohol on 3.34 days per week.

Our overall results are shown in Table 8.2. These estimates suggest that a weekly frequency of around 2-3 days per week is the most appropriate number of drinking occasions to use when interpreting statistical modelling of the health impacts of various patterns and volumes of drinking in Australia.

Table 8.2. Estimated drinking days per week, Australian drinkers (NHS 2014/15 and NDSHS 2016)

<table>
<thead>
<tr>
<th>Data and method</th>
<th>Estimate (95% confidence interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Health Survey 14/15 – single question</td>
<td>2.03 (1.99, 2.08)</td>
</tr>
<tr>
<td>National Drug Strategy Household Survey 16 – single question</td>
<td>2.06 (2.02, 2.10)</td>
</tr>
</tbody>
</table>

It should be noted that these estimates remain highly uncertain. Population level alcohol consumption in surveys captures around 50% of the volume of alcohol recorded via more objective measures (sales, tax collection) (Livingston et al 2018). The reasons for this are varied – in particular respondents under-estimating their drinking and heavy drinkers being either excluded from the sampling frame (e.g. if they are homeless) or being less likely to respond.
Appendix 2: Administrative Report

Introduction

In March 2009, NHMRC released the Australian Guidelines to Reduce Health Risks from Drinking Alcohol, providing policy makers, health professionals and the Australian community with evidence-informed advice concerning the health risks of drinking alcohol. At the 203rd session in March 2015, the Council of NHMRC considered the status of the 2009 Alcohol Guidelines as part of its routine process to consider whether current clinical practice and public health guidelines that are over five years of age require revision. Council recommended to NHMRC’s Chief Executive Officer that the 2009 Alcohol Guidelines be updated.

Contributors

The Guidelines were developed with the expertise of the Alcohol Working Committee (see Section 9.2 Alcohol Working Committee). The Office of NHMRC managed the process and representatives from the Department of Health participated as observers at committee meetings.

Current NHMRC Project Team
- Cathy Connor: Director Public Health Team
- Catherine King: Assistant Director Public Health Team
- Melanie Grimmond: Senior Project Officer, Public Health Team

Previous NHMRC Project Team
- Zeinab Bazzi
- Heather Kirk
- Tanja Farmer
- Rebecca Rees
- Elaine Stone

Contractors
- University of Adelaide, systematic reviewers
- Cochrane Australia, systematic reviewers
- Cochrane Australia and South Australia Health and Medical Research Institute, systematic reviewers
- Clinical Trials Centre, University of Sydney, methodological reviewers
- Sheffield Alcohol Research Group, Sheffield University, mathematical modellers.
Governance

The Australian Government Department of Health commissioned NHMRC to update the 2009 Guidelines, and contributed funding to the comprehensive evidence evaluation and other project costs. NHMRC provided funding for staffing, committee costs and the mathematical modelling. NHMRC sought input from the Department of Health, NHMRC’s Consumer and Community Advisory Group and its Principal Committee Indigenous Caucus to finalise the draft guidelines prior to public consultation.

All draft research protocols and evidence evaluation reports were considered and advised on by the Alcohol Working Committee in line with its Terms of Reference (see Section 9.2 Alcohol Working Committee). The Committee advised on the development of the guidelines as described below. The Council of NHMRC considered the draft guidelines on 6 December 2019 and recommended to the NHMRC Chief Executive Officer that they be released for public consultation. The NHMRC Chief Executive Officer agreed to release the guidelines for public consultation on 16 December 2019.

Guideline development

NHMRC has published evidence-based guidelines to help Australians reduce the risk of harm associated with drinking alcohol since 1987. The previous edition, Australian Guidelines to reduce health risks from drinking alcohol, was published by NHMRC in 2009. Research on the health effects of alcohol is continuously evolving and new studies are published regularly. For this reason, NHMRC reviews its guidelines to ensure that the advice is up to date and reflects the latest body of evidence.

In 2015, the Council of NHMRC, in consultation with the Department of Health, requested the guidelines be revised. The Alcohol Working Committee was appointed to guide this revision. It is an independent expert committee comprising expertise in clinical and public health, alcohol policy, alcohol research, consumer advocacy, epidemiology and biostatistics (see Terms of Reference and membership in this report).

The 2009 guidelines took a novel approach to reporting on the health risks of drinking, providing new information about the risks of alcohol-related harm over a lifetime. Specifically, the 2009 guidelines conveyed to the Australian public and policy makers a new concept of the risk of harm progressively increasing as the amount of alcohol consumed increases. In these revised guidelines, NHMRC has retained this approach but simplifies the messages further by separating the guidelines into three distinct categories: healthy adults, children and young people, and pregnant or breastfeeding women.

An internationally recognised approach was used to synthesise the evidence and translate this into guideline recommendations and accompanying text. This approach - GRADE (Grading of Recommendations Assessment, Development and Evaluation) is described further in this Administrative report. In developing the recommendations, quality evidence from a range of sources was considered as detailed below.

NHMRC is increasingly developing ‘living’ guidelines, using methods that enable elements or modules of a guideline to be updated as the evidence changes. This ensures guidelines are current, relevant and responsive to emerging evidence. For this guideline, NHMRC has presented the recommendations and other information in the MAGICapp platform to allow for a ‘living’ guideline, one where NHMRC can update any part of the guideline should the relevant body of evidence change.
The evidence base for the guidelines

These guidelines were informed by:

- An evidence evaluation of 38 systematic reviews that assessed short- and longer-term health risks and benefits of varying levels and/or patterns of alcohol consumption.

- Four additional systematic reviews on the specific health effects of drinking alcohol on mental health, long-term mild cognitive impairment, and on the fetuses, babies and children of women drinking alcohol while pregnant or breastfeeding.

- Mathematical modelling of the health risks associated with varying levels and patterns of alcohol consumption.

- The 2009 guidelines, where the evidence underpinning this advice was deemed to be still current.

- Data from the most recent surveys and reports such as the 2016 National Drug Strategy Household Survey.

- Additional publications accepted after the initial evidence evaluation (described below).

Assessing the evidence

The methods used to analyse and interpret the evidence aligned with international best practice. These are summarised below with further process information available within each report or document. Since publication of the previous edition of the Guidelines, there have been substantial advances in the methodology for guideline development and formatting, and these have been used for this revised guideline. This includes the use of the Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodology and the MAGICapp platform for publication.

Scoping

NHMRC undertook a scoping activity to assist the Committee determine whether all or part of the 2009 Guidelines needed to be updated, and to identify any gaps in the existing guidelines.

NHMRC scanned the published literature for new scientific evidence that had emerged since the 2007 systematic review that underpinned the 2009 Guidelines. The purpose of this search was to assess the volume of evidence published since 2007 in order to identify priority areas for the revision of the 2009 Guidelines. This search encompassed literature published from 1 January 2007 until May 2016 and was restricted to systematic reviews and/or meta-analyses. In addition, references listed in the report from the UK Committee on Carcinogenicity Statement on consumption of alcoholic beverages and risk of cancer (2016), published alongside the draft UK guidelines, were included. A thorough assessment of the evidence or quality of the systematic reviews was not performed; only abstracts were retrieved. The results of the literature search indicated where evidence on the health effects of alcohol has grown and areas where the evidence is still lacking. The search was structured around the four guideline recommendations included in the 2009 Guidelines.

NHMRC also compared the existing 2009 Guidelines with other national and international guidelines.
Public call for evidence

NHMRC conducted a public call for evidence between 25 November 2016 and 13 January 2017 to capture relevant studies and issues of public concern. To be considered, publications had to meet certain quality criteria:

- High quality studies based on scientific research (systematic reviews, randomised controlled trials and observational studies including cohort, case-control or nested case control studies).
- Published after the search of the literature for the 2009 guidelines.
- Evidence that assessed the health effects of varying levels and/or patterns of alcohol consumption (alcohol only, not in combination with other drugs) that were generalisable to the Australian population.
- Publically available and published in the English language in peer reviewed journals.

Evidence from the public call were used to support and update the content within the guidelines. A summary of the evidence used to develop each recommendation and the accompanying information is included in each of the guideline chapters.

Systematic reviews

Two systematic review activities were used.

Systematic review of systematic reviews

An overview of systematic reviews was completed to consider the short-term and long-term health risks and benefits associated with various levels and patterns of drinking alcohol (exposure). The analysis focused on identifying systematic reviews and meta-analyses published since 2007, to identify areas where the evidence has grown since the 2009 Guidelines. The Clinical Trials Centre from the University of Sydney was engaged from the NHMRC Health Evidence Panel to do this evaluation. The report of this overview was finalised in January 2018 and can be found on the public consultation portal.

Systematic reviews

Four systematic reviews were commissioned by NHMRC to address identified gaps in existing review evidence. These included evidence on the association of alcohol exposure and mental health, long-term cognitive impairment, pregnancy and breastfeeding. All reviewers were engaged from NHMRC’s Health Evidence Panel, and its successor the Health Evidence and Methods Panel, following a competitive tender process. The evidence review teams completed a declaration of interest process before being appointed by NHMRC and no conflicts of interest were identified.

The independent evaluations of the evidence were undertaken in accordance with research protocols approved by the NHMRC Project Team, based on advice from the Alcohol Working Committee. The research protocols outlined the scope, scientific question and methodology of each review. The methods and results of the review are detailed in Evidence Evaluation Reports and Technical Reports finalised in November 2018, found on the public consultation portal. These include the research questions using the PECO approach (population, exposure, comparator, outcomes), the search strategy, methods used to select, appraise and summarise the evidence, results, and evidence profiles.
The contracted reviewers were:

i. Adelaide Health Technology Assessment, the University of Adelaide (reviewing the association between alcohol consumption and mental health disorders)

ii. Cochrane Australia (reviewing the association between alcohol consumption and long-term cognitive impairment)

iii. Cochrane Australia and South Australia Health and Medical Research Institute reviewing the:

   a. association between different levels and patterns of alcohol consumption during pregnancy and birth defects and behavioural problems in fetuses, babies and children, and

   b. association between different levels and patterns of maternal alcohol consumption while breastfeeding and health outcomes for breastfed babies and children (up to age five).

The Evidence Evaluation Reports and Technical Reports were published on the NHMRC website in December 2019, to coincide with the public consultation on the draft Guidelines.

**Mathematical modelling**

Guideline One is informed by mathematical modelling which estimates the risk of dying from alcohol-related disease and injury from different levels and patterns of drinking. The model simulates the relationship between any given level of alcohol consumption and the risk of disease and death for different age groups in Australia. The risk threshold chosen for this guideline corresponds to a 1 in 100 chance of dying from alcohol-related disease or injury for an average, healthy adult person who drinks alcohol (see Guideline One Rationale). This is consistent with the threshold used in the NHMRC 2009 Alcohol Guidelines. The analyses from the modelling are outlined in more detail in the Modelling Report.

Modelling was undertaken using an adaptation of the Sheffield Alcohol Policy Model v2.7. It is a mathematical simulation model which has previously been used to assess alcohol policy options in the United Kingdom and internationally. For more information about the modelling and how it was used to develop the guideline recommendation, see Section 5.3.2.

**Engaging the modellers: the procurement approach**

Sheffield Alcohol Research Group, based at Sheffield University in the United Kingdom, was commissioned by NHMRC in accordance with Commonwealth Procurement Rules (Conditions for Limited Tender – Division 2, Clause 10.3). Other options were considered, but directly engaging Sheffield Alcohol Research Group was justified as the modelling could be supplied only by this group given the specific technical requirements, and that there was no reasonable alternative or substitute. Typically, but not always, the circumstances prescribed are such that limited tendering is the only practical alternative available to procure such services.

Advice was sought from NHMRC’s procurement, financial and legal teams, as well as an external legal advisor on procurement matters, and the Australian Government Department of Finance. As in any limited tender approach, the procurement policy framework still applied and when making the decision to undertake this procurement, the delegate confirmed that the spending proposal followed the Commonwealth Procurement Rules and achieved value for money.
Quality assurance step: Independent methodological review

Independent methodological review of the five systematic reviews described above were completed to ensure they followed the systematic and rigorous approach specified in the respective research protocol. The methodological review of the overview was completed by Ms Lisa Jones, Reader in Public Health, Liverpool John Moores University, Liverpool UK.

The Clinical Trials Centre from the University of Sydney (CTC) was engaged from the NHMRC Health Evidence and Methods Panel (this panel replaced the Health Evidence Panel, whose term expired 30 May 2018) to methodologically review the four systematic reviews.

Public consultation

Public consultation is a core feature of the guideline development work of the NHMRC, contributing to the accountability of the agency and the independence of the advice. For the draft guidelines, public consultation was undertaken from 16 December 2019 to 24 February 2020. The process was conducted in accordance with Section 13 of the NHMRC Act.

Public consultation was advertised on the NHMRC website, NHMRC Tracker, and social media platforms. Invitations were also sent to a large number of key stakeholders.

A report on the consultation and key issues to be added in 2020.

Quality assurance step: Independent expert review

Seeking nominations for Expert Review

The NHMRC project team and Alcohol Working Committee advised on acceptance criteria for nominations for individuals who could undertake expert review of the draft guidelines following public consultation. These include the reviewer:

- Having appropriate knowledge of the evidence base underpinning public health guideline about alcohol consumption.
- Being familiar with the translation of public health evidence into advice or guidelines.
- Having familiarity with GRADE process highly desirable.
- Declaring interests according to NHMRC policies, and any interests are deemed either not in conflict with the guideline development process, or manageable through an appropriate strategy.

How expert review comments will be utilised

The Council of NHMRC and the Chief Executive Officer will make a determination on how the expert review feedback will be actioned. This is not the role of the Alcohol Working Committee. This provides independence to the expert review process and accountability for the guideline development.
Alcohol Working Committee

Appointment process
The Alcohol Working Committee was established by a CEO delegate, under section 39 of the National Health and Medical Research Council Act 1992. The Committee was selected to ensure appropriate expertise in the key areas of clinical and public health research, and evidence-based methodologies, in order to oversee and provide expertise in updating the 2009 Australian Guidelines to Reduce Health Risks from Drinking Alcohol. A person with expertise in the health needs of Aboriginal persons and Torres Strait Islanders and a person with expertise in consumer issues was also sought.

Terms of Reference
These were as follows:
• Consider the process for development of the 2009 Guidelines and identify priority areas for review.
• Guide the development of an evaluation of the evidence, including modelling, on the health effects of drinking alcohol, focusing on studies/data published since 2007
• Consider the outcomes of the evidence evaluation, and use these findings to inform the update of NHMRC’s Australian Guidelines to Reduce Health Risks from Drinking Alcohol (2009).
• Consider comments received during consultation on the draft revised Guidelines.
• Update the revised draft with consideration to comments received from public consultation and expert review.

The Alcohol Working Committee reported to the Council of NHMRC.

Membership
Appointments to the Committee were effective from 23 May 2016 until 30 November 2020. The Members were:

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
<th>Area of expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor Kate Conigrave</td>
<td>Senior Staff Specialist and Professor of Addiction Medicine at Royal Prince Alfred Hospital and Sydney Medical School, the University of Sydney</td>
<td>Clinical and Public Health Research</td>
</tr>
<tr>
<td>(Chair)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professor Emily Banks</td>
<td>Researcher in chronic disease epidemiology at the Australian National University</td>
<td>Epidemiology</td>
</tr>
<tr>
<td>(Deputy Chair)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professor Robert Ali</td>
<td>Director, Community Based Treatment Drug and Alcohol Service SA and Director, WHO Collaborating Centre</td>
<td>Clinical Public Health</td>
</tr>
<tr>
<td>Dr Rebecca Armstrong</td>
<td>Director of Public Health Insight, the University of Melbourne, and Joint Co-ordinating Editor, Cochrane Public Health</td>
<td>Methodologist Public Health</td>
</tr>
<tr>
<td>Professor Tanya Chikritzhs</td>
<td>Professor at the National Drug Research Institute, Curtin University</td>
<td>Epidemiology Biostatistics</td>
</tr>
<tr>
<td>Professor Peter d’Abbs</td>
<td>Academic, Menzies School of Health Research</td>
<td>Research Sociologist Policy ATSIH</td>
</tr>
</tbody>
</table>
### Disclosure of interest process

Appointees to committees of NHMRC are required to disclose their interests consistent with section 42A of the NHMRC Act and instructions issued under sections 16A and 16B of the Public Governance, Performance and Accountability Rule 2014 (made under subsection 29(2) of the Public Governance, Performance and Accountability Act 2013 (PGPA Act). Prospective members were specifically asked to identify, to the best of their ability, interests including:

- **Financial interests:** an interest must be declared when benefits or losses either in money or in-kind have occurred or may occur at a level that might reasonably be perceived to affect a person’s judgement in relation to fair decisions about evidence and their participation in group decision-making.

- **Other relationships:** an interest must be declared when a strong position or prejudice or familial connection or other relationship held by a person could reasonably, or be perceived to, affect a person's judgement in relation to fair decisions about evidence and their participation in group decision-making including making an effort to arrive at a consensus.

- **Affiliations to or associations with any organisations or activities which could reasonably be perceived to be an influence due to a competing interest either for or against the issues being considered by the committee.**

- **Any other influences which might reasonably be considered likely to affect the expert judgement of the individual, or lead to the perception by others that the judgement of the individual is compromised.**

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<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
<th>Area of expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor Mark Harris</td>
<td>Professor of General Practice, Scientia Professor, and Executive Director at the Centre for Primary Health and Equity, the University of New South Wales</td>
<td></td>
</tr>
<tr>
<td>Ms Nicole Hewlett</td>
<td>Project manager, Menzies School of Health Research</td>
<td>Aboriginal and Torres Strait Islander representative</td>
</tr>
<tr>
<td>Dr Michael Livingston</td>
<td>National Drug and Alcohol Research Centre, University of New South Wales Director of Public Health Insight, the University of Melbourne, and Joint Co-ordinating Editor, Cochrane Public Health.</td>
<td>Research Epidemiology Modelling</td>
</tr>
<tr>
<td>Professor Dan Lubman</td>
<td>Director, Turning Point at Eastern Health, and Professor of Addiction Studies and Services at Monash University.</td>
<td>Clinical Research Mental health</td>
</tr>
<tr>
<td>Dr Colleen O’Leary</td>
<td>Research Associate at Curtin University, and Coordinator, Standards Monitoring at Western Australian Office of the Chief Psychiatrist</td>
<td>Research Policy FASD</td>
</tr>
<tr>
<td>Professor Alison Ritter</td>
<td>Director at Drug Policy Modelling Program, and Deputy Director, National Drug and Alcohol Research Centre</td>
<td>Policy Research</td>
</tr>
<tr>
<td>Ms Anne McKenzie</td>
<td>Head, Consumer and Community Health Research Network, the University of Western Australia</td>
<td>Consumer advocate</td>
</tr>
<tr>
<td>Mr Scott Wilson</td>
<td>Director of Aboriginal Drug and Alcohol Council, South Australia</td>
<td>Consumer advocate</td>
</tr>
</tbody>
</table>
Under the PGPA Act, members have a responsibility to declare any interests to the whole committee and members have a joint responsibility to decide on the management of any perceived or real conflict. No unmanageable conflicts were identified by the Committee or NHMRC.

Throughout the project, members were reminded of their obligation to consider any interest that may have arisen since the last meeting or with any particular agenda items. All disclosures and determinations about interests were recorded in the minutes of the Committee meetings. Members’ relevant expertise and a summary of their disclosed interests were accessible on the NHMRC website throughout the duration of the project.
## Appendix 3: Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>The term ‘alcohol’ describes a series of organic chemical compounds, but only one type, ethyl alcohol or ethanol, is found in drinks intended for human consumption. This is the type that is the subject of these guidelines. Other forms of alcohol, including methanol, are more toxic to humans than ethanol and are not suitable for human consumption.</td>
</tr>
<tr>
<td>Dependence</td>
<td>Alcohol dependence refers to when a person has a strong drive to drink, which comes about after repeated, regular drinking. They have two of the three features: loss of control over drinking; physiological features (tolerance or withdrawal); and/or alcohol becomes a higher priority than other things in a person’s life.</td>
</tr>
<tr>
<td>Drinking occasion</td>
<td>In these guidelines, a drinking occasion refers to a sequence of drinks taken without the blood alcohol concentration reaching zero in between. This might include one or more drinks at home at the end of the day or over dinner, or at a specific event, such as a party, night out, visit to the pub, a family or business event or other function. It may also include drinking spread across more than one context or venue, for instance on a ‘Friday night out’.</td>
</tr>
<tr>
<td>Fetal Alcohol Spectrum Disorder</td>
<td>Fetal Alcohol Spectrum Disorder (FASD) is the umbrella term for the spectrum of adverse effects that can be seen in infants, children, adolescents and adults exposed to a range of amounts of alcohol during pregnancy.</td>
</tr>
<tr>
<td>GRADE</td>
<td>Grading of Recommendations Assessment, Development and Evaluation (GRADE) is an approach to rate the quality of evidence and grade the strength of recommendations in healthcare.</td>
</tr>
<tr>
<td>Risk</td>
<td>The probability (chance) that an outcome may occur. For further information refer to Section 4 Understanding risk.</td>
</tr>
<tr>
<td>Lifetime risk</td>
<td>Lifetime risk is the measure of risk that a certain event will happen during a person’s lifetime. For further information refer to Section 4 Understanding risk.</td>
</tr>
<tr>
<td>Tolerance</td>
<td>The immediate effects of alcohol on the brain are often less apparent in people who drink regularly, as they acquire a degree of tolerance. Tolerance occurs because the person’s brain learns to cope with, and compensate for, the deficits induced by alcohol. Also, their liver becomes a little more efficient at breaking down alcohol.</td>
</tr>
</tbody>
</table>
# Appendix 4: Abbreviations and acronyms

<table>
<thead>
<tr>
<th>Abbreviations and acronyms</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIFS</td>
<td>Australian Institute of Family Studies</td>
</tr>
<tr>
<td>AIHW</td>
<td>Australian Institute of Health and Welfare</td>
</tr>
<tr>
<td>AWC</td>
<td>Alcohol Working Committee</td>
</tr>
<tr>
<td>BAC</td>
<td>blood alcohol concentration</td>
</tr>
<tr>
<td>CALD</td>
<td>culturally and linguistically diverse</td>
</tr>
<tr>
<td>DSM – 5</td>
<td>Diagnostic Statistical Manual of Mental Disorders</td>
</tr>
<tr>
<td>FASD</td>
<td>Fetal Alcohol Spectrum Disorder</td>
</tr>
<tr>
<td>GRADE</td>
<td>Grading of Recommendations Assessment, Development and Evaluation</td>
</tr>
<tr>
<td>HED</td>
<td>heavy episodic drinking</td>
</tr>
<tr>
<td>NHMRC</td>
<td>National Health and Medical Research Council</td>
</tr>
<tr>
<td>PECO</td>
<td>population, exposure, comparator, outcomes</td>
</tr>
<tr>
<td>SARG</td>
<td>Sheffield Alcohol Research Group</td>
</tr>
<tr>
<td>SAPM</td>
<td>Sheffield Alcohol Policy Model</td>
</tr>
<tr>
<td>SAPM-AU</td>
<td>The Australian adaptation of the Sheffield Alcohol Policy Model</td>
</tr>
</tbody>
</table>
Number of Standard Drinks – Beer

<table>
<thead>
<tr>
<th>Number</th>
<th>Type</th>
<th>Volume</th>
<th>Alcohol %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>285ml</td>
<td>Full</td>
<td>4.8%</td>
</tr>
<tr>
<td>0.8</td>
<td>885ml</td>
<td>Mid</td>
<td>3.5%</td>
</tr>
<tr>
<td>0.6</td>
<td>285ml</td>
<td>Low</td>
<td>2.7%</td>
</tr>
<tr>
<td>1.6</td>
<td>425ml</td>
<td>Full</td>
<td>4.8%</td>
</tr>
<tr>
<td>1.2</td>
<td>425ml</td>
<td>Mid</td>
<td>3.5%</td>
</tr>
<tr>
<td>0.9</td>
<td>425ml</td>
<td>Low</td>
<td>2.7%</td>
</tr>
<tr>
<td>1.4</td>
<td>375ml Standard</td>
<td>Full</td>
<td>4.8%</td>
</tr>
<tr>
<td>1</td>
<td>375ml Standard</td>
<td>Mid</td>
<td>3.5%</td>
</tr>
<tr>
<td>0.8</td>
<td>375ml Standard</td>
<td>Low</td>
<td>2.7%</td>
</tr>
<tr>
<td>1.4</td>
<td>375ml Light</td>
<td>Full</td>
<td>4.8%</td>
</tr>
<tr>
<td>1</td>
<td>375ml Light</td>
<td>Mid</td>
<td>3.5%</td>
</tr>
<tr>
<td>0.8</td>
<td>375ml Light</td>
<td>Low</td>
<td>2.7%</td>
</tr>
</tbody>
</table>

Appendix 5: Australian Standard Drinks
NUMBER OF STANDARD DRINKS – SPIRITS

1
30ml
High Strength Spirit Nip
40% Alc. Vol

22
700ml
High Strength Bottle of Spirits
40% Alc. Vol

1.1
975ml
Full Strength RTD*
5% Alc. Vol

1.2
330ml
Full Strength RTD*
5% Alc. Vol

2.6
660ml
High Strength RTD*
5% Alc. Vol

1.5
975ml
High Strength RTD*
7% Alc. Vol

1.8
330ml
High Strength RTD*
7% Alc. Vol

3.6
660ml
High Strength RTD*
7% Alc. Vol

1
250ml
Full Strength Pre-mix Spirits
5% Alc. Vol

1.2
300ml
Full Strength Pre-mix Spirits
5% Alc. Vol

1.5
375ml
Full Strength Pre-mix Spirits
5% Alc. Vol

1.7
440ml
Full Strength Pre-mix Spirits
5% Alc. Vol

1.4 – 1.9
High Strength Pre-mix Spirits
7% – 10% Alc. Vol

1.6
250ml
High Strength Pre-mix Spirits
7% Alc. Vol

2.1
300ml
High Strength Pre-mix Spirits
7% Alc. Vol

2.4
440ml
High Strength Pre-mix Spirits
7% Alc. Vol

* Based on Drink
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