

*Alcohol is a known risk factor for cancer. There is no evidence to suggest that alcohol may be protective for any form of cancer.*

### Key messages and recommendations

- Alcohol is a known risk factor for cancer. Heavy alcohol use can also cause short- and long-term health problems such as cirrhosis of the liver, alcohol dependence, strokes, suicide, injury and car accidents.
- There is *convincing* evidence that alcohol is associated with an increased risk of cancers of the mouth, pharynx, larynx, oesophagus, colorectum (in men) and breast.
- Alcohol *probably* increases the risk of colorectal cancer in women and liver cancer.
- Unlike cardiovascular disease, there is no evidence that alcohol at any level has any protective effect against cancer.
- The Cancer Council recommends that people **limit** or **avoid** drinking alcohol.
- Those who do not drink should not take up drinking alcohol.
- For people who do drink alcohol, the recommended amounts are an average of no more than two standard drinks a day for men, and an average of no more than one standard drink a day for women. A standard drink contains 10g alcohol, and is equal to 285mL full strength beer, 450mL of low-alcohol (light) beer, 100mL wine and 30mL spirits.
- People should avoid binge drinking (excessive drinking in one session), and have one or two alcohol-free days per week.
- Smoking and alcohol together have a synergistic effect on cancer risk, meaning the combined effects are significantly greater than individual risks added together. Therefore messages about alcohol should be targeted at smokers in particular.
- Alcohol can easily contribute to weight gain; excessive body fat is also a risk factor for developing certain cancers.
- Behaviours such as increased exercise, smoking cessation and healthy eating should be encouraged to prevent heart disease, instead of alcohol consumption. Antioxidants in red wine and other alcoholic beverages can be obtained from fruits and vegetables.
- Further research is needed to:
  - verify the corresponding level of risk associated with different patterns of drinking
  - investigate further potential mechanisms of action
  - establish the effect of lowering alcohol consumption on cancer risk
  - determine effective strategies for reducing alcohol consumption in populations with a high intake

## Background

Alcohol is a known risk factor for cancer. There is no evidence that the consumption of any alcoholic beverage provides any protection against cancer in human studies.

Since 1988, alcohol has been recognised as a **Group 1 carcinogen** (highest rating for carcinogens) by the International Agency for Research on Cancer (IARC), for cancers of the mouth, pharynx, larynx, oesophagus and liver.<sup>1</sup>

Sadly, the misuse of alcohol is a major preventable cause of death and hospitalisation in Australia. Besides cancer, heavy use of alcohol can cause short-term and long-term health problems such as cirrhosis of the liver, alcohol dependence, strokes, suicide, injury and car accidents. Because alcohol is frequently drunk in excess by young people, it is responsible for many lost years of life.

## Epidemiological evidence

There is no evidence from studies in human populations that any alcohol consumption provides protection against cancer. Alcohol is a significant risk factor for some cancers, particularly those of the mouth, pharynx, larynx, oesophagus, breast, colorectum and liver.<sup>2-4</sup>

The most recent major report by the World Cancer Research Fund (WCRF) on food and the prevention of cancer concluded there was *convincing* evidence that alcohol was associated with an increased risk of cancer of the mouth, pharynx, larynx, oesophagus, colorectum (in men) and breast.<sup>3</sup> Alcohol *probably* increases the risk of colorectal cancer in women and liver cancer.<sup>3</sup> It is *unlikely* that alcohol effects kidney cancer risk.<sup>3</sup>

Alcohol has been estimated to cause between 3 and 12% of breast cancer cases.<sup>5,6</sup> A large meta-analysis of 53 epidemiological studies showed that the relative risk of breast cancer increased with increasing intake of alcohol.<sup>7</sup> The relative risk of breast cancer was 1.32 (95% CI= 1.19-1.45,  $p < 0.00001$ ) for an intake of 35-44g alcohol per day, and 1.46 (95% CI= 1.33-1.61,  $p < 0.00001$ ) for > 45g alcohol per day, compared with women who reported drinking no alcohol.<sup>7</sup> The relative risk of breast cancer increased by 7.1% (95% CI= 5.5-8.7,  $p < 0.00001$ ) for each additional 10g per day intake of alcohol, i.e. for extra standard drinks of alcohol consumed on a daily basis.<sup>7</sup>

The approximately 30-40% higher risk of breast cancer in women consuming at least 30g/day of alcohol versus non drinkers is similar to or slightly stronger than associations observed for several reproductive factors and a positive family history.<sup>7</sup> Unlike these other risk factors, alcohol intake is a potentially modifiable behaviour.

## Burden of disease

Australian data suggests that alcohol intake accounts for 3.1% of the total cancer burden and a net effect (i.e. harmful and beneficial effects) of 2.3% of the total burden of disease.<sup>8</sup> (Burden of disease describes years of life lost due to premature death coupled with years of healthy life lost due to disability.) In 2003, there were an estimated 2,844 new cases of cancer and 1,358 deaths from cancer attributed to excessive alcohol consumption.<sup>9</sup>

Two different methods of estimating the amount of disease caused by alcohol, based on any alcohol consumption or only unsafe alcohol consumption, have been reported in Australia. These two methods produce very different results as shown in Table 1.



**Table 1.** Cancer site and percentage attributable to alcohol

Cancer site	English et al (1995) <sup>5</sup>		Ridolfo & Stevenson (2001) <sup>6</sup>	
	Males %	Females %	Males %	Females %
Breast	-	3	-	12
Larynx	21	13	51	46
Liver	18	12	39	35
Oesophagus	14	6	46	40
Oropharynx	21	8	40	31

One method compared unsafe levels of alcohol consumption with moderate or no consumption, recognising the benefits of moderate alcohol consumption for heart disease.<sup>5</sup> This is consistent with public health policy on alcohol consumption, which is not to achieve zero alcohol intake in the population but to achieve harm minimisation. In contrast, the other approach estimated the full attributable effect of alcohol consumption, including the apparent benefits of moderate consumption.<sup>6</sup> The rationale for this method was to take into account the fact that alcohol even at low levels of consumption can raise the risk of some conditions, such as cancer.

The financial cost of disease, injury and crime caused by alcohol in Australia has been estimated to be in excess of \$7.6 billion. The exact proportion attributable to alcohol-related cancer is not clear.<sup>10</sup>

### Misconceptions of health benefit

There are mixed messages and some conflict around the risks and benefits of alcohol consumption for different chronic diseases. Whilst alcohol is a risk factor for cancer, the evidence in relation to cardiovascular disease is mixed. High alcohol consumption is associated with higher blood pressure and death from stroke; however, a small amount of alcohol, such as red wine, taken regularly may protect against coronary heart disease in middle-aged people.<sup>11</sup> Thus, from a cancer point of view, alcohol consumption is undesirable; whereas from a heart disease point of view, low alcohol consumption may be beneficial.

The effect on cancer risk is from ethanol, irrespective of the type of alcoholic beverage.<sup>3</sup> Red wine, which has some health benefits for conditions such as heart disease, has been associated with increased cancer risk. So in this context alcohol is best consumed with meals; highly concentrated alcoholic beverages should be avoided.<sup>12</sup> It is also important to note that the antioxidants in red wine and other beverages, which provide some cardiac benefit if consumed at low levels, are also available in fruit and vegetables without cancer risk.

### Smoking and drinking: synergies for high risk

Smoking and alcohol together have a synergistic effect on upper gastrointestinal and aerodigestive cancer risk, meaning the combined effects greatly exceed the risk from either one alone.<sup>13</sup> For example, compared with the risk for non-smoking non-drinkers, the approximate relative risks for developing mouth and throat cancer are seven times greater for people who use tobacco, six times greater for those who use alcohol, and 38 times greater for those who use both tobacco and alcohol.<sup>14</sup>



This synergistic effect of alcohol and smoking has been estimated to be attributable for over 75% of cancers of the upper aero-digestive tract in developed countries.<sup>14</sup> Alcohol has an independent effect on the risk of oral, pharyngeal, laryngeal and oesophageal cancers, but its synergistic effect with smoking is most significant.

## How alcohol causes cancer

Several hypotheses have been proposed for how alcohol consumption affects cancer risk. Both local and systemic effects may explain the biological mechanisms.

Further studies are needed to determine causal pathways, such as:

- Ethanol may cause cancer through the formation of acetaldehyde.<sup>12</sup> The first step in alcohol metabolism is the oxidation of alcohol to acetaldehyde, via the enzyme alcohol dehydrogenase. Acetaldehyde is the primary metabolite of ethanol, which has been shown to be mutagenic by binding to DNA.<sup>12</sup> Therefore alcohol can be regarded more as a co-carcinogen, facilitating tumour initiation or acting as a tumour promoter rather than a tumour initiator itself.
- Alcohol may play an important role in anatomical sites where it comes into direct contact with the tissue, by irritating the epithelium or increasing the penetration of carcinogens across the mucosa. This may be through increasing the solubility of carcinogens entering the oral mucosa or perhaps increasing the permeability of the oral mucosa.<sup>12</sup> In addition, a decrease in salivary flow would lead to a decreased clearing of mucosal surfaces, which could lead to accumulation of carcinogens.<sup>12</sup>
- Alcoholic drinks may contain carcinogenic contaminants such as nitrosamines, polycyclic aromatic hydrocarbons, and mycotoxins, as well as a wide variety of esters, phenols and other compounds derived from interaction between the original plant material and the production processes.<sup>3</sup>
- Alcohol may have systemic effects as well as local effects. Firstly it is known that heavy drinkers are frequently malnourished and chronic alcohol consumption may affect the liver's ability to deal with toxic or potentially carcinogenic compounds.<sup>12</sup> Secondly, it has been suggested that alcohol may have an immunosuppressive effect.<sup>12</sup> However, the systemic effects of alcoholic beverages are thought to be not as strong as the local effects.<sup>15,16</sup> If alcohol was truly having an immunosuppressive effect, it would be expected that there would be a higher incidence of specific cancers where infection is a causal factor in heavy drinkers.
- Alcohol may increase the risk of breast cancer because acute ingestion of high doses can increase serum estradiol concentrations.<sup>17</sup>

## Factors influencing alcohol consumption

Alcohol consumption can be influenced by environmental factors such as responsible service by staff, price of drinks, availability of non-alcoholic beverages and food, provision of alternative entertainment and transport options.<sup>11</sup>

Heavy drinkers often drink in bars. There seems to be a higher level of harm associated with nightclubs, hotels and taverns, compared with restaurants and clubs.<sup>18</sup> However, this difference may be due to the nature of the customers that visit these sites.<sup>18</sup> Wine drinkers are more likely to drink socially at private homes.<sup>11</sup>



Young people have an increased risk of drinking, as risk-taking behaviour accelerates through puberty and they begin to be independent and explore peer values.<sup>11</sup> Surveys have found there are high rates of alcohol-related problems among adolescents in countries where alcohol is illegal at that age.<sup>11</sup> The draft Australian alcohol guidelines for low-risk drinking suggest not drinking is the safest option for adolescents aged 15-17 years. However, if drinking does occur, it should be under parental supervision and within the adult guidelines for low-risk drinking (i.e. two standard drinks or less in any one day).<sup>19</sup>

## Alcohol consumption in Australia

Per capita alcohol consumption among Australian adults has remained relatively stable over the past decade. Recently, Australia ranked 22nd in the world in terms of per capita consumption of pure alcohol with 9.0 litres (L) per person.<sup>20</sup> Beer and wine consumption in people aged 15 years and over has decreased recently in Australia, while spirit consumption has increased, probably due to growth in the availability of ready-to-drink spirit products.<sup>21</sup>

From 1998 to 2001, the estimated proportion of the population consuming alcohol at high-risk levels for chronic harm remained relatively stable among males and females of all ages. There was, however, increased consumption among girls aged 14 to 17 years and a small decline among young males.<sup>22</sup>

In 2001, 62% of all alcohol consumed by Australians of all ages was drunk during a single drinking session that exceeded low-risk levels for episodic drinking (e.g. binge drinking).<sup>22</sup> For males and females aged 14-17 years, this proportion was substantially higher, at 80% and 85% respectively.<sup>22</sup>

The 2007 National Drug Strategy Household Survey found the proportion of the population drinking daily declined significantly between 2004 and 2007, from 8.9% to 8.1% of Australians aged 14 years or older.<sup>23</sup> However, the number of those drinking at least weekly remained constant at 41%.<sup>23</sup>

Nearly three quarters (73%) of Australians aged 14 years or older consumed alcohol in quantities that were considered a low risk to health in the long term, while 10% consumed alcohol in a way considered risky or a high risk to their health in the long term.<sup>23</sup> Respondents in the 20–29 years age group were most likely to consume alcohol in a way that put them at risk of alcohol-related harm in the long term.<sup>23</sup>

Experience with alcohol is common among teenagers; use increases with age.<sup>24</sup> The Australian School Students Alcohol and Drug (ASSAD) survey showed that by age 15 around 90% of students have tried alcohol, and by age 17, 70% of students had drunk alcohol in the month prior to the survey.<sup>24</sup> The proportion of students drinking in the week prior to the survey increased with age, from around 16% of those aged 13 to about half of those aged 17 years.<sup>24</sup>

People from culturally and linguistic diverse communities are more likely to be non-drinkers than those from English-speaking backgrounds.<sup>11</sup>

Although Aboriginal and Torres Strait Islander Australians are more likely to abstain from alcohol than the general population, alcohol-related problems are of particular concern for these peoples.<sup>25</sup> A national survey of Aboriginal and Torres Strait Islander peoples estimated that about 15% of Indigenous Australians drink at risky or high-risk levels, compared with about 14% of non-Indigenous people.<sup>25</sup> However, deaths from alcohol-attributable conditions are about 2½ times greater for Aboriginal and Torres Strait Islander peoples than the general population.<sup>26</sup>



## Recommendations

Unlike cardiovascular disease, there is no evidence that alcohol at any level has any protective effect against cancer. In addition, alcohol contains substantial energy, so it can easily contribute to weight gain. Excessive body fat is also a risk factor for developing certain types of cancer.

Therefore the Cancer Council recommends people **limit** or **avoid** drinking alcohol. Those who do not drink should not take up drinking alcohol. For people who do drink alcohol, recommended amounts are an average of no more than two standard drinks a day for men, and an average of no more than one standard drink a day for women.

A standard drink contains 10g alcohol. These are all equal to one standard drink:

- 100mL of wine (one bottle of wine contains around 7 standard drinks)
- 30mL (one nip) of spirits
- 60mL (two nips) of sherry
- 285mL (one middy) of normal strength beer
- 450mL (one schooner) of low alcohol (light) beer
- 220-250mL ready to drink alcoholic sodas (around 2/3 bottle)

Women are advised to drink less alcohol than men, because of their smaller body size and because of the potential to increase the risk of breast cancer. Women with a family risk of breast cancer in particular should abstain from alcohol. Women who are at high risk of breast cancer and low risk of heart disease may benefit from reducing to light or moderate alcohol consumption.

People should also avoid binge drinking (excessive drinking in one session), and have one or two alcohol-free days per week. This recommendation is in line with the National Health and Medical Research Council's alcohol guidelines.<sup>11</sup> It is important *not* to save up drinks per day and have them all in one drinking session. Heavy drinking with little food intake should also be avoided.

The combined effects of smoking and alcohol are significantly greater than the risk from the individual risks added together. Messages about alcohol should therefore be targeted at smokers in particular.

Behaviours such as increased exercise, smoking cessation and a healthy eating pattern should be encouraged to prevent heart disease instead of alcohol consumption. The antioxidants found in red wine and other alcoholic beverages can also be obtained from fruits and vegetables.

## Future research

In the future, there is a need for more studies that:

- verify the corresponding level of risk associated with different patterns of drinking
- investigate further potential mechanisms of action
- establish the effect of lowering alcohol consumption on cancer risk
- determine effective strategies for reducing alcohol consumption in populations with a high intake.

Approved by Cancer Council Australia's National Alcohol Committee, July 2008. With thanks to the Cancer Council NSW.





## Further information

<http://www.cancer.org.au/File/PolicyPublications/NCPP/NCPP07-09Alcohol.pdf>

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