



Guidance on Alcohol and Cancer Risk

Key Messages

Alcohol is a known risk factor for cancer. 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, car accidents and foetal alcohol syndrome.

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 Society recommends that people limit drinking alcohol.

For people who drink alcohol, the recommended amounts are an average of no more than 2 standard drinks a day for men, and an average of no more than 1 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 also 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. This means the combined effects of smoking and alcohol are significantly greater than the risk from the individual risks added together. Therefore, messages about alcohol should be targeted at smokers in particular.

Pregnant women are advised to avoid alcoholic drinks because of the risk to the foetus. There is no known safe level of consumption of alcohol for pregnant women. Drinking at any time during pregnancy may affect the foetus. The harms that result from pre-natal exposure to alcohol are not related to cancer but range from mild intellectual and behavioural issues to profound disabilities.

Background

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

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.¹

The misuse of alcohol is a major preventable cause of death and hospitalisation in New Zealand. Besides cancer, heavy use of alcohol can cause short-term and long-term health problems such as cirrhosis of the liver, alcohol dependence, strokes, intentional and unintentional injuries including those resulting from motor vehicle crashes. Alcohol is frequently drunk in excess by young people and is responsible for many lost years of life. The health burden falls inequitably on Māori.²

The pattern of drinking is very important in determining positive or negative health effects of alcohol consumption and there are no benefits in drinking alcohol before middle age.²

Epidemiological Evidence

There is no evidence in human population studies 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.^{3, 45}

The most recent major report by the World Cancer Research Fund (WCRF 2007) 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.⁴ Alcohol *probably* increases the risk of colorectal cancer in women and liver cancer.⁴ The report also concluded that it is *unlikely* that alcohol affects kidney cancer risk.⁴

Alcohol has been estimated to cause between 3 and 12 percent of breast cancer cases.^{6, 7} A large meta-analysis of 53 epidemiological studies showed that the relative risk of breast cancer increased with increasing intake of alcohol.⁸ The relative risk of breast cancer was 1.32 (95 percent CI= 1.19-1.45, p<0.00001) for an intake of 35-44g alcohol per day, and 1.46 (95 percent CI= 1.33-1.61, p<0.00001) for > 45g alcohol per day, compared with women who reported drinking no alcohol.⁸ The relative risk of breast cancer increased by 7.1 percent (95 percent CI= 5.5-8.7, p<0.00001) for each additional 10g per day intake of alcohol, i.e. for each extra standard drink of alcohol consumed on a daily basis.⁸

The approximately 30-40 percent 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 (early menarche, late natural menopause, not bearing children and late (over 30) first pregnancy) and a positive family history.⁸ Unlike these other risk factors, alcohol intake is potentially modifiable.

Burden of Disease Related to Alcohol

A 2005 report ⁹ estimated that 3.9 percent of all deaths (around 1040 deaths) in New Zealand in 2000 were attributable to alcohol consumption. Of these 24 percent (around 250) were alcohol related cancer deaths.

The New Zealand Cancer Registry¹⁰ indicates there were 18,610 new registrations for cancer and 7970 recorded deaths from cancer in 2005 (see Table 1 for actual figures).

Cancer of the colorectum was the most commonly registered cancer and the second in the causes of death. In women, breast cancer was both the most commonly registered and the most common cause of death.

Table 1: Registration and death rates for type of cancer 2005 ¹⁰

Type of Cancer	Registrations 2005			Deaths 2005		
	male	female	total	male	female	total
Mouth and pharynx	195	90	285	88	38	126
Oesophagus	148	71	219	130	66	196
Liver	149	74	223	95	45	140
Colorectal and anus	1331	1385	2716	608	614	1222
Breast	21	2458	2479	5	647	652
Total	1844	4078	5922	926	1410	2336

Note: Cancer of the larynx figures are not specified in New Zealand statistics.

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 2.

One method compared unsafe levels of alcohol consumption with moderate or no consumption, recognising the benefits of moderate alcohol consumption for heart disease.⁶ 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.⁷ 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.

Table 2: Cancer site and percentage attributable to alcohol

Cancer Site	English et al (1995) ⁵		Ridolfo & Stevenson (2001) ⁷	
	Males percent	Females percent	Males percent	Females percent
Breast	-	3	-	12
Larynx	21	13	51	46
Liver	18	12	39	35
Oesophagus	14	6	46	40
Oropharynx	21	8	40	31

Other Considerations for Alcohol

Alcohol is one dietary factor where there is conflict between risks and benefits for different chronic diseases. While alcohol is a risk factor for cancer, the evidence in relation to cardiovascular disease is mixed. A high intake of alcohol is associated with higher blood pressure and death from stroke; however, a small amount of alcohol, such as red wine, taken regularly may be protective against coronary heart disease in middle aged people.^{2, 11} 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.¹²

The effect on cancer risk is from ethanol, irrespective to the type of alcoholic beverage.³ Red wine, which has some health benefits for conditions such as heart disease, has been associated with increased cancer risk.

Smoking and alcohol together have a synergistic effect on upper gastrointestinal and aero-digestive cancer risk.¹² This means the combined effects of smoking and alcohol greatly exceed the risk from either one of these factors alone.¹² Alcohol and tobacco interact in a multiplicative way on the risk of cancers of the upper aero-digestive tract. For example, compared with the risk for non-smoking non-drinkers, the approximate relative risks for developing mouth and throat cancer are 7 times greater for those who use tobacco, 6 times greater for those who use alcohol, and 38 times greater for those who use both tobacco and alcohol.¹³

This synergistic effect of alcohol and smoking has been estimated to be attributable for over 75percent of cancers of the upper aero-digestive tract in developed countries.¹³ Alcohol has an independent effect on the risk of oral, pharyngeal, laryngeal and oesophageal cancers, but it is its synergistic effect with smoking that is most significant.

Potential Mechanisms of Action

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

- Ethanol may cause cancer through the formation of acetaldehyde.¹¹ 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.¹¹ 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.¹¹ In addition, a decrease in salivary flow would lead to a decreased clearing of mucosal surfaces, which could lead to accumulation of carcinogens.¹¹
- 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.³
- 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.¹¹ Secondly, it has been suggested that alcohol may have an immunosuppressive effect.¹¹ However, the systemic effects of alcoholic beverages are thought to be weaker than the local effects.^{14, 15} 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.¹⁶

Further studies are needed to determine causal pathways.

Factors Influencing Alcohol Consumption

Alcohol consumption can be influenced by environmental factors, such as advertising and promotion, host responsibility, price, availability of non-alcoholic beverages and food, provision of entertainment venues that do not serve alcohol and safe transport options.¹⁰

Heavy drinkers often drink in bars where alcohol service is the focus, and there seems to be a higher level of harm associated with nightclubs, hotels and taverns compared to restaurants and clubs where food service is the primary focus or attraction.¹⁷ However, this difference may be due to the nature of the customers that visit these sites.¹⁷ Wine drinkers are more likely to drink socially at private homes.¹⁰

Alcohol Consumption in New Zealand

Alcohol consumption data in New Zealand is very limited and most of the data relates to harmful consumption (in terms of risks such as injury and violence, not cancer risk.) This reflects both Ministry of Health targets and current policy which focus on harm minimisation. So while there is data on the overall prevalence of alcohol consumption much of the more specific data relates to hazardous consumption in terms of drunkenness, drunk driving and binge drinking.

Consumption data from the ALAC website¹⁸ shows that:

- an estimated 81.2 percent (95 percent confidence interval: 80.1-82.3) of New Zealanders aged 12-65 years had consumed alcohol in the last 12 months.
- males were significantly more likely to have consumed alcohol in the last 12 months (82.5 percent; 80.9-84.0) than females (78.4 percent; 76.8-80.0).
- non- Māori were significantly more likely to have consumed alcohol in the last 12 months (81.3 percent; 80.0-82.6) than Māori (74.2 percent; 72.8-75.7).
- 1.8 percent (1.4-2.2) of people aged 12-65 years had produced home-made alcohol (beer, wine and/or spirits) in the last 12 months.
- among people who had travelled overseas in the last 12 months, 63.0 percent (60.2-65.9) had bought duty-free alcohol into New Zealand at least once in the last 12 months.

Among New Zealanders aged 12-65 years who had consumed alcohol in the last 12 months, it has been found:

- 14.7 percent (13.6-15.7) consumed large amounts of alcohol at least once a week (for males this represents more than six standard drinks on one drinking occasion; for females this represents more than four standard drinks on one drinking occasion) males were

significantly more likely to have consumed large amounts of alcohol at least once a week (19.7 percent; 18.1-21.4) compared to females (11.1 percent; 9.7-12.5).

- 96 percent have tried alcohol at some stage or other and most of these (96percent) have had a 'full' glass
- 88 percent of those who had ever had a 'full' glass define themselves as current drinkers, with 37 percent drinking at least two or three times a week or daily
- 74 percent report having ever drunk five or more drinks on one occasion and of these, 36 percent have done so in the last two weeks. (53 percent more than once)
- one-quarter (25 percent) of all adults (drinkers and non-drinkers) engage in risky drinking on a relatively frequent basis.

Other alcohol statistics ¹⁸ include:

- in 2004 New Zealand ranked 24th in the world out of 50 countries in terms of per capita consumption of pure alcohol
- nearly half the population thinks it is 'OK' to get drunk
- 1.2 million drinkers are 'OK' with binge drinking, accept binge drinking and regularly binge drink themselves
- alcohol is estimated to cost the public health sector \$655 million per year (2004 figures)
- ALAC estimates alcohol harm costs New Zealand somewhere between \$1billion and \$4 billion a year.

Recommendations

Unlike cardiovascular disease, there is no evidence that alcohol at any level has any protective effect against cancer. In addition, alcohol contains a lot of 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 Society recommends people limit drinking alcohol. For people who drink alcohol, the recommended amounts are an average of no more than 2 standard drinks a day for men, and an average of no more than 1 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 half pint) of normal strength beer
- 450mL (one pint) of low alcohol (light) beer
- 220-250mL ready to drink alcoholic sodas (alco-pops) (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. It is important not to save up drinks per day and have them

all in one drinking session. It is also a good idea to avoid heavy drinking with little food intake.

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 the promotion of any level of alcohol consumption. The antioxidants found in red wine and other alcoholic beverages can also be obtained from fruits and vegetables.

Pregnant women are advised to avoid alcoholic drinks because of the risk to the foetus. There is no known safe level of consumption of alcohol for pregnant women and drinking at any time during pregnancy may affect the foetus. The harms that result from pre-natal exposure to alcohol range from mild intellectual and behavioural issues to profound disabilities.¹⁹ Evidence does not show the effects are related to cancer.

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.

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References

1. International Agency for Research on Cancer. *Monographs on the evaluation of carcinogenic risks to humans: alcohol drinking*. Volume 44. Lyon: IARC. 1988.
2. The burden of death, disease and disability due to alcohol in New Zealand. ALAC Occasional Publication No. 23, February 2005.
3. International Agency for Research on Cancer. *Monographs on the evaluation of carcinogenic risks to humans: alcoholic beverage consumption and ethyl carbamate (urethane)*. Volume 96. Lyon: IARC. 2007
4. The World Cancer Research Fund and American Institute for Cancer Research. *Food, nutrition, physical activity and the prevention of cancer: a global perspective*. Washington DC: AICR. 2007
5. World Health Organisation. Diet, nutrition and the prevention of chronic diseases. Geneva, WHO. 2003
6. English D, Holman CDJ, Milne E, Winter MG, Hulse GK, Codde JP et al. The quantification of drug caused morbidity and mortality in Australia. Commonwealth Department of Human Services and Health. AGPS. 1995
7. Ridolfo B, Stevenson C. The quantification of drug-caused mortality and morbidity in Australia, 1998. Canberra, AIHW. 2001.
8. Collaborative Group on Hormonal Factors in Breast Cancer. Alcohol, tobacco and breast cancer-collaborative reanalysis of individual data from 53 epidemiological studies, including 58,515 women with breast cancer and 95,067 women without the disease. *Br J Cancer*; **87**(11): 1234-1245. 2002.
9. <http://www.nzhis.govt.nz/moh.nsf/pagesns/32>
10. National Health and Medical Research Council. *Australian Alcohol Guidelines: health risks and benefits*. Canberra: AGPS. 2001.
11. Poschl G, Seitz HK. Alcohol and cancer. *Alcohol & Alcoholism.*; **39**(3): 155-165.2004.
12. Doll R, Forman D, La Vecchia C, Woutersen R. Alcoholic beverages and cancers of the digestive tract and larynx. In: *Health Issue Related to Alcohol Consumption*. Macdonald L (editor). Oxford: Blackwell Science Ltd. pp. 351-393.1999.
13. Blot WJ. Alcohol and cancer. *Cancer Res.* **52**(7 Suppl): 2119s-2123s.1992.

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14. Cattaruzza MS, Maisonneuve P, Boyle P. Epidemiology of laryngeal cancer. *Eur J Cancer B Oral Oncol*; **32B**(5): 293-305. 1996.
 15. Rothman KJ, Cann CI, Fried MP. Carcinogenicity of dark liquor. *Am J Public Health*.; **79**(11): 1516-1520. 1989.
 16. Coutelle C, Hohn B, Benesova M, Oneta CM, Quattrochi P, Roth HJ *et al.* Risk factors in alcohol associated breast cancer: alcohol dehydrogenase polymorphism and estrogens. *International Journal of Oncology*; **25**(4): 1127-1132. 2004.
 17. Stockwell T, Somerford P, Lang E. The relationship between licence type and alcohol-related problems attributed to licenced premises in Perth, Western Australia. *Journal of Studies on Alcohol*; **53**: 495-498.1992.
 18. <http://www.alac.org.nz/NZStatistic.aspx?PostingID=16709>
Alcohol Use in New Zealand Analysis of the 2004 New Zealand Health Behaviours Survey Alcohol Use
 19. Ministry of Health. Food and Nutrition Guidelines for Healthy Pregnant and Breastfeeding Women: A background paper. Wellington: Ministry of Health. 2006.