Alcohol-attributable burden of disease and injury in New Zealand: 2004 and 2007

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This study was commissioned by the Alcohol Advisory Council of New Zealand.[a]

DISCLAIMER

The observations, analysis, and viewpoints expressed in this report remain those of the authors and shall not be attributed to the HPA.

[a] Since 1 July 2012 all the functions of the Alcohol Advisory Council (ALAC) have been carried out by the Health Promotion Agency (HPA).

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EXECUTIVE SUMMARY

INTRODUCTION

Estimates of the 2000/02 burden of death and disability due to alcohol consumption in New Zealanders[1] have been used widely by researchers and policymakers. In the eight years since the previous estimates were published, more recent alcohol consumption data and burden estimation methods have become available. This report, *Alcohol-attributable burden of disease and injury in New Zealand: 2004 and 2007*, responds to the need for revised New Zealand estimates of death and disability due to alcohol consumption.

The report is organised as follows:

- Methods used to estimate the burden of death (2004 and 2007) and the burden of death and disability (2004) due to alcohol consumption in New Zealanders aged 0–79 years.
- Developments in methods since the previous New Zealand burden of alcohol report (NZBoA2000/02).
- Deaths in 2004 and 2007 due to alcohol consumption, estimated as deaths and years of life lost (YLLs) by age/sex/ethnicity (Māori/non-Māori) subgroups.
- Combined death and disability in 2004 due to alcohol consumption, estimated as disability-adjusted life years (DALYs) by age/sex subgroup.
- Key findings, limitations, comparisons with previous analyses, and public health implications.

METHODS

We used World Health Organization (WHO) comparative risk assessment (CRA) methods to measure the impact of alcohol on the health of New Zealanders. The contribution of alcohol consumption to the health burden was quantified for each age/sex/ethnicity subgroup and alcohol-related condition/injury with alcohol-attributable fractions (AAFs) that were calculated by combining New Zealand alcohol consumption data with the best available risk estimates. The mortality and morbidity AAFs estimated the proportions of death and disability, respectively, that would have been prevented if alcohol consumption was eliminated from a given subgroup. Death and disability due to alcohol consumption were then estimated for New Zealand subgroups by applying the mortality AAFs to New Zealand 2004 and 2007 mortality data and morbidity AAFs to WHO's 2004 disability estimates for New Zealand.

Since the publication of the previous NZBoA2000/02 report,[1] the Global Burden of Disease 2010 Risk Factors Collaborating Group has revised some of the alcohol burden calculation methods.[2] This means that any differences in results between the reports are due to a combination of several factors

and must not be interpreted as having occurred solely due to changes in alcohol consumption of New Zealanders. Some changes to the methods used in this report were:

- The inclusion of four new causes of alcohol-attributable mortality and morbidity.
- The use of alcohol consumption estimates from surveys with differing data collection methods.
- Limitation of the analysis to New Zealanders aged 0–79 years.
- Considering abstainers and ex-drinkers separately.
- The use of updated relative risk estimates to calculate AAFs.
- The incorporation of drinking pattern data into ischaemic heart disease AAF calculations.

KEY FINDINGS

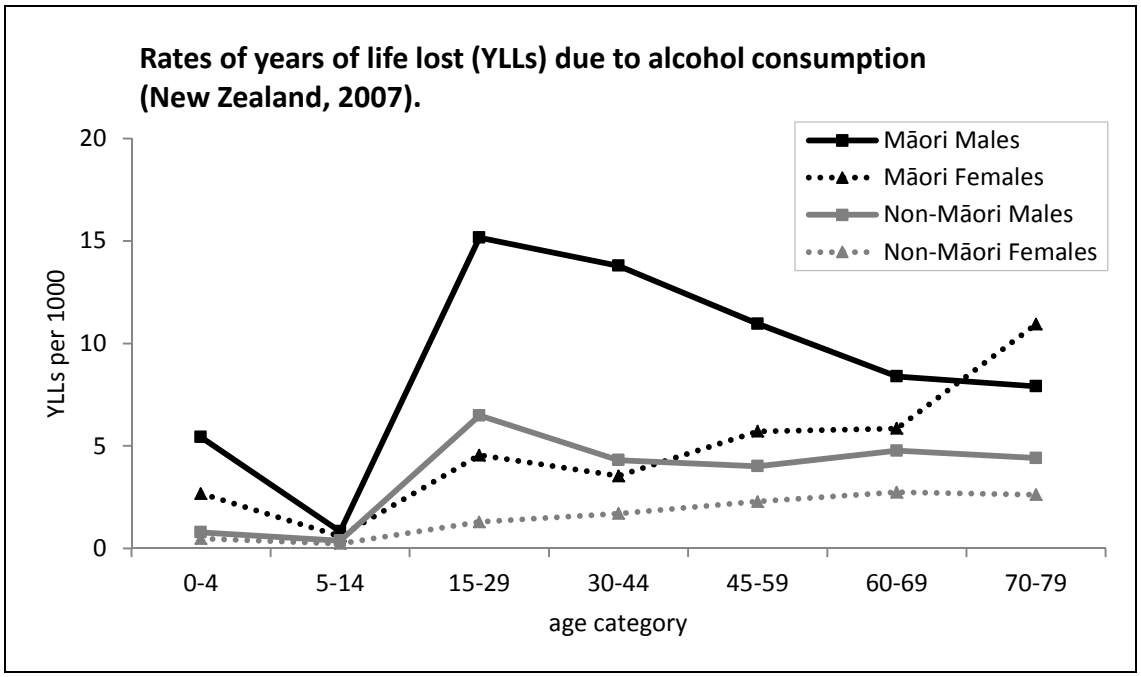
The burden of mortality due to alcohol consumption in New Zealanders was estimated as deaths and years of life lost (YLLs). The burden of morbidity (i.e. non-fatal impacts of alcohol consumption on health) was incorporated in estimates of alcohol-attributable disability-adjusted life years (DALYs) that combined the impact of alcohol on mortality (YLLs) and morbidity (years of life lived with a disability; YLDs).

Alcohol is relevant to the health of adults of all ages. However, data on both alcohol consumption and risk relationships in the age group of 80 years and over were considered too unreliable and incomplete to estimate the mortality or DALY burden of alcohol. Therefore, all the results discussed below are only for New Zealanders aged 0–79 years.

2007 Alcohol-attributable mortality

Overall, 802 deaths in New Zealanders aged 0–79 years were attributed to alcohol consumption in 2007, representing 5.4% of all deaths under 80 years old. These deaths represented 13,769 years of life lost (YLLs) attributable to alcohol. Alcohol consumption was also estimated to prevent 351 deaths but only 3,095 YLLs. The alcohol-attributable mortality estimates and key findings were similar in 2004.

Figure 1: Sex and ethnic disparities were observed in the alcohol-attributable mortality burden



Men were more likely to be harmed by alcohol consumption than women.

- Overall, the number of male deaths due to alcohol consumption (n = 537) was double the number of deaths in women (n = 265) and the alcohol-attributable YLL burden was 2.4 times higher in men (n = 9,720) than women (n = 4,049).
- Alcohol consumption was estimated to cause 6.1% of all male deaths and 4.3% of all female deaths.
- In both Māori and non-Māori, men had more than double the standardised death rates of women (adjusted for the effect of different age structures in sex/ethnicity subgroups).

Alcohol-attributable mortality was higher in Māori than non-Māori.

- The proportion of total annual deaths attributed to alcohol consumption was higher for Māori men and women (8.3% and 5.7%) than non-Māori men and women (5.7% and 4.0%).
- The standardised alcohol-attributable death rate for Māori overall was 2.5 times the rate for non-Māori.
- The age/ethnicity-specific alcohol-attributable death and YLL rates for Māori were more than 1.8 times the corresponding non-Māori rates for each age group.
    - Māori males lost the most years of life due to alcohol consumption for almost all age categories, with the rate of YLLs lost peaking in 15–29 year olds.

Injuries were responsible for a large share of the alcohol-attributable mortality burden

Overall, injuries were responsible for:

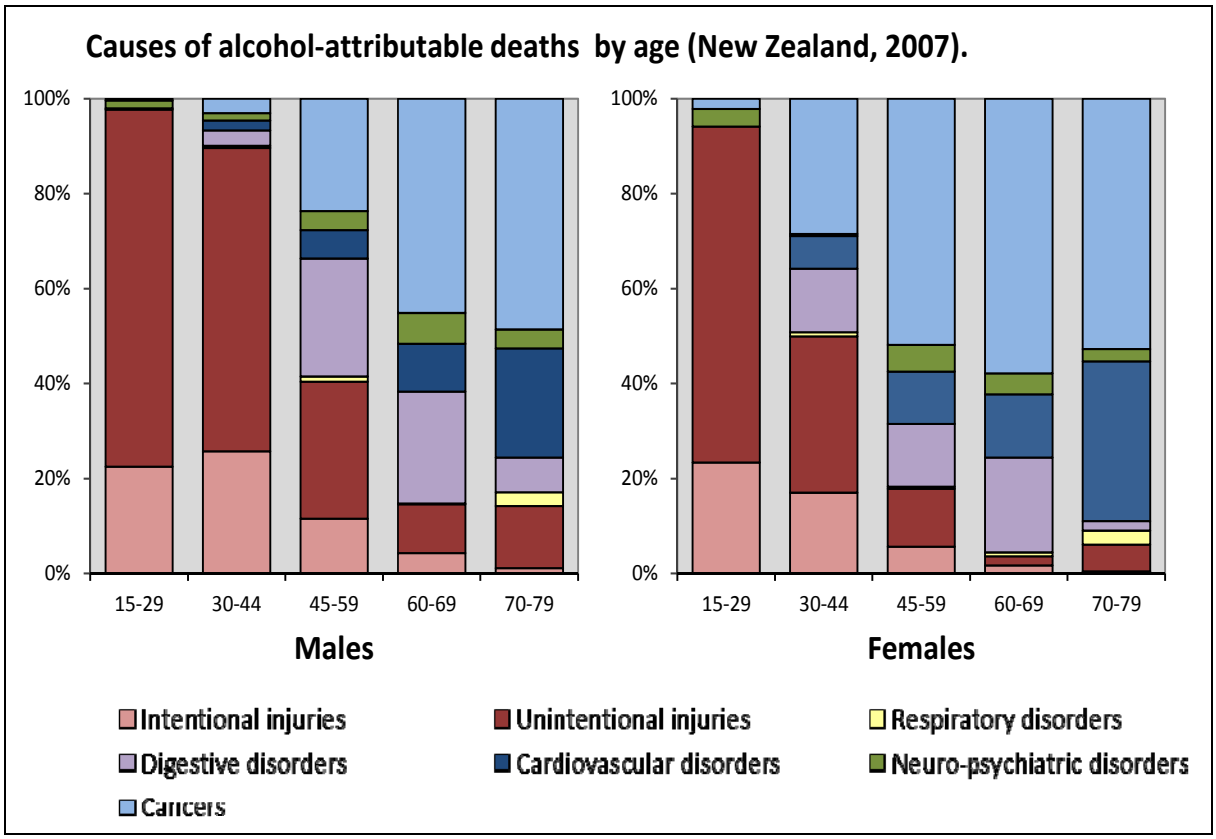
- 52% of alcohol-attributable deaths in men (n = 280) and 25% of alcohol-attributable deaths in women (n = 66).
- 73% of the alcohol-attributable YLLs in men (n = 7,066) and 42% of the YLLs in women (n = 1,708).

Most sex and ethnic disparities in alcohol-attributable mortality were due to differences in injury deaths.

Injuries were the dominant cause of alcohol-attributable deaths in adults aged 15–44 years.

- For 15–29 year old males, 30–44 year old males and 15–29 year old females: more than 90% of all alcohol-attributable deaths were due to injuries, and the five leading causes of alcohol-attributable deaths were all injury categories.

There was a transition with increasing age from injuries causing most alcohol-attributable deaths in younger adults (15–44 years) to conditions such as cancers and cardiovascular disorders being responsible for a larger proportion of alcohol-attributable deaths in older age groups (45–79 years). This transition was more apparent and occurred later in life for men than women.



Specific leading causes of alcohol-attributable mortality

Table 1: Top five causes of alcohol-attributed (AA) deaths (0-79 years; New Zealand 2007)

Males	% of AA deaths	Females	% of AA deaths
Māori	**(N = 124)**	**Māori**	**(N = 62)**
Road traffic injuries	32.1%	Female breast cancer	19.0%
Other unintentional injuries	13.1%	Road traffic injuries	17.4%
Self-inflicted injuries	10.2%	Ischaemic heart disease	16.3%
Alcoholic liver cirrhosis	5.7%	Alcoholic liver cirrhosis	6.5%
Drownings	5.6%	Haemorrhagic stroke	6.4%
Non-Māori	**(N = 414)**	**Non-Māori**	**(N = 203)**
Road traffic injuries	15.8%	Female breast cancer	29.3%
Alcoholic liver cirrhosis	13.3%	Haemorrhagic stroke	12.2%
Self-inflicted injuries	10.6%	Alcoholic liver cirrhosis	10.8%
Other unintentional injuries	7.6%	Colon cancer	8.5%
Oesophagus cancer	7.4%	Road traffic injuries	7.5%

For Māori and non-Māori men:

- Road traffic injuries were the most common cause of alcohol-attributable deaths.
- Self-inflicted injuries, other unintentional injuries and alcoholic liver cirrhosis were also among the leading causes of deaths due to alcohol consumption.

For Māori and non-Māori women:

- Breast cancer was the most common cause of alcohol-attributable deaths.
- Road traffic injuries, haemorrhagic stroke and alcoholic liver cirrhosis were also among the leading causes of deaths due to alcohol consumption.

Road traffic injuries and self-inflicted injuries were the first and second specific leading causes of alcohol-attributable deaths for 15–29 year old males, 30–44 year old males and 15–29 year old females.

Alcoholic liver cirrhosis was a common cause of alcohol-attributable deaths for 30–69 year old females and 45–69 year old males.

2004 Alcohol-attributable disability-adjusted life years (DALYs)

Alcohol-attributable disability-adjusted life years (DALYs) were estimated for 2004, the most recent year for which the required data were available from the WHO Global Burden of Disease study. One lost DALY indicates the loss of one year of full health, as DALYs combine the time lost due to both fatal and non-fatal events (i.e. years of life lost due to premature death (YLLs) and years of 'healthy' life lost due to disability (YLDs)).

Overall, 28,403 years of 'healthy' life (i.e. DALYs) lost in New Zealanders aged 0–79 years were attributed to alcohol consumption in 2004, representing 6.5% of all DALYs lost in New Zealanders under 80 years old. Alcohol consumption was estimated to prevent 6,538 DALYs.

Disparities between men and women were observed in the alcohol-attributable DALY burden:

Men were more likely to be harmed by alcohol consumption than women.

- The number of DALYs lost in men (n = 18,803) was double that of women (n = 9,601).
- Alcohol consumption was estimated to cause 8.8% of all male DALYs and 4.3% of all female DALYs.
- The standardised rate of DALYs lost due to alcohol consumption was 2.1 times higher in men than women.

ALCOHOL USE DISORDERS AND INJURIES WERE RESPONSIBLE FOR A LARGE PROPORTION OF THE ALCOHOL-ATTRIBUTABLE DALY BURDEN:

Table 2: Top five causes of alcohol-attributable disability-adjusted life years (AA DALYs) lost (0-79 years; New Zealand 2004).

	% of AA DALYs		% of AA DALYs
Males	**(N = 18803)**	**Females**	**(N = 9601)**
Alcohol use disorders	42.5%	Alcohol use disorders	50.0%
Road traffic injuries	18.8%	Female breast cancer	12.2%
Self-inflicted injuries	7.8%	Road traffic injuries	10.3%
Other unintentional injuries	6.5%	Cirrhosis of the liver	4.3%
Cirrhosis of the liver	3.8%	Other unintentional injuries	3.5%

Alcohol use disorders:

- Overall, alcohol use disorders were the leading cause of alcohol-attributable DALYs for both men (43%) and women (50%).
- The contribution of alcohol use disorders to the DALY burden was almost entirely due to non-fatal effects (i.e. YLDs).
- Injuries:
- Overall, injuries were responsible for 42% of the alcohol-attributable DALY burden in men (n = 7,972) and 22% of the DALY burden in women (n = 2,109).
- Injuries were the dominant cause of alcohol-attributable deaths and DALYs in young adults. For 15–29 year olds, 89% of all alcohol-attributable DALYs in males and 74% of all alcohol-attributable DALYs in females were due to injuries.

Specific leading causes of alcohol-attributable DALYs:

Alcohol use disorders were the dominant cause of alcohol-attributable DALYs in men and women over 30 years old.

Road traffic injuries were responsible for the largest proportion of alcohol-attributable DALYs in 15–29 year old males and females.

LIMITATIONS

Our analysis has important limitations that should be considered when interpreting or using the estimates. These are detailed in the report. Caution is required when interpreting the preventive effects of alcohol consumption (even at low levels of drinking). These effects need to be considered alongside the greater alcohol-attributable health risks rather than in isolation, and the likely overestimation of the effects due to inherent weaknesses in the research evidence needs to be kept in mind. The findings in this report are not directly comparable with those of the previous report (i.e. as a tool for monitoring the impact of changes in alcohol consumption) because the methodology used to produce the estimates presented in the current report differs from the NZBoA2000/02 estimates in several major respects.

Despite the potential weaknesses and sources of uncertainty in our analysis, the updated methods we used for this report resulted in burden estimates that are an improvement over those presented in the previous NZBoA2000/02 report.

PUBLIC HEALTH IMPLICATIONS

Overall, this analysis shows that alcohol consumption is a major risk factor for burden of disease and injury. No level of alcohol consumption is without risk, although high average consumption and frequency of heavy drinking occasions are associated with the most risk of harm to the drinker and to others.

The main messages from the previous report are upheld by the current analysis.

1. There are no health benefits of drinking before middle age, and benefits in later life are uncertain.
2. The pattern of drinking is very important in determining the health effects of alcohol consumption.
3. Injury is responsible for a large proportion of the alcohol burden: 43% of alcohol-attributable deaths, 63% of years of life lost and 36% of DALYs lost due to alcohol.
4. There is a huge burden of disability due to alcohol use disorders that is not reflected in mortality figures.
5. The health burden of alcohol falls inequitably on Māori.

6. The health of men as measured in this study is more affected by alcohol than the health of women. This may not apply to health impacts that are outside the scope of this study, such as harm from the drinking of others.

The effects of alcohol on public health are large enough to motivate population-wide interventions in New Zealand and globally. We know more than ever about which strategies can successfully and cost-effectively control alcohol-related harms. WHO's *Global strategy to reduce harmful use of alcohol* was ratified at the World Health Assembly in 2010, in order to coordinate an effective evidence-based response.

A detailed set of recommendations to reduce alcohol-related harm in New Zealand, based on international research evidence and tailored to the New Zealand policy environment, was put forward by the New Zealand Law Commission at the conclusion of an extensive review in 2010.

Key elements of both the Global strategy and the Law Commission recommendations are a set of synergistic changes to the regulation of alcohol that include:

- Reducing the physical availability of alcohol.
- Increasing the price of alcohol.
- Reducing marketing and promotion of alcohol.
- Lowering the legal blood alcohol concentration (BAC) limit for driving.
- Raising the alcohol purchase age.

INTRODUCTION

The first comprehensive estimates of the 'burden of death, disease and disability due to alcohol in New Zealand' were published in 2004 by the Alcohol Advisory Council of New Zealand.[1] The estimates in this previous report (NZBoA2000/02) were based on data from 2000 (mortality) and 2002 (disability-adjusted life years) and have since been widely used, for example by the New Zealand Law Commission in reviewing the impacts of alcohol in New Zealand.[3]

In the eight years since the NZBoA2000/02 report was published, new alcohol consumption survey data have been collected in New Zealand and there have been advances in several of the methods used to estimate alcohol-attributable mortality and morbidity (i.e. death and disability). In view of these changes and the perceived usefulness of New Zealand alcohol-attributable fraction and burden estimates to researchers and policymakers, a revision is warranted.

The aim of this ALAC-funded project was to use the most current data and methods available to calculate the following New Zealand estimates for mortality and morbidity due to alcohol-attributable conditions and injuries:

- Alcohol-attributable deaths and years of life lost (YLLs) for 2004 and 2007.
    - by age/sex/ethnicity (Māori/non-Māori) subgroup.
- Alcohol-attributable disability-adjusted life years (DALYs) for 2004.
    - by age/sex subgroup.

METHODS: ALCOHOL-ATTRIBUTABLE MORTALITY (2004 & 2007)

SUMMARY

A number of steps were required to calculate the numbers and types of deaths caused by alcohol in New Zealand during 2004 and 2007. The estimates presented in this report were facilitated by the use of country-level burden of disease templates developed and provided by the World Health Organization.

1. We identified which alcohol-attributable conditions and injuries to include (pages 12–17).
2. We determined total New Zealand deaths due to these alcohol-attributable conditions and injuries in 2004 and 2007 by age group, sex, and Māori/non-Māori ethnicity (page 18).
3. For each alcohol-attributable condition category, we calculated mortality alcohol-attributable fractions (AAFs) by age/sex/ethnicity subgroup.

   Data requirements

   a. We obtained New Zealand estimates for the following alcohol consumption levels and patterns by age, sex and ethnicity; calculated best estimates for pregnant and elderly subpopulations for whom limited data were available (pages 18–32).

      Volume of alcohol consumption

      i. Prevalence of lifetime abstainers, ex-drinkers, and current drinkers.
      ii. Average daily alcohol consumption.

      Pattern of alcohol consumption

      iii. Prevalence of people with irregular heavy drinking occasions for each level of average daily alcohol consumption (for ischaemic heart disease calculations).

   b. For each age/sex/ethnicity subgroup, we obtained the best relative risk (RR) estimates by alcohol-attributable condition (pages 35–39).

   Calculations

   c. AAFs for alcohol-related conditions were estimated for each age/sex/ethnicity subgroup by combining the relative risk and alcohol consumption data; ischaemic heart disease AAF calculations included additional alcohol consumption categories and accounted for irregular heavy drinking patterns (page 34).

4. For each alcohol-related injury category, we determined the best AAF estimates by age/sex/ethnicity subgroup. We considered two different approaches for estimating injury AAFs:

With the assistance of the Global Burden of Disease 2010 Risk Factors Collaborating Group, we used detailed drinking pattern data from each age/sex/ethnicity subgroup to model the AAFs for different types of injuries.

a. The face validity of the modelled GBD injury AAFs was poor for some New Zealand subgroups, so we have described these methods and results as a sensitivity analysis (see Appendix C).
b. We reviewed the sources of injury AAFs used in the previous NZBoA2000/02 report[1] and sought new research evidence for updating these AAFs.
    ii. There was little new evidence to inform changing the AAFs except for a few minor modifications in the youngest age groups. Therefore, most of the injury AAFs used in our main analysis were from the NZBoA2000/02 report (pages 39–41).

5. We applied AAF estimates to mortality data: deaths and years of life lost (pages 41–48).

ALCOHOL-ATTRIBUTABLE CONDITIONS AND INJURIES

Alcohol-related conditions

Table 3 lists the conditions that are included in the mortality analyses of this report. The Global Burden of Disease (GBD) 2010 Risk Factors Collaborating Group of the GBD 2005/2010 study has identified these conditions as being either wholly or partially attributable to alcohol.[2] One late addition to the GBD 2010 Risk Factors Assessment for alcohol was the impact of alcohol on worsening the disease course of HIV/AIDS, via higher non-adherence to antiretroviral treatment.[4,5] This change was made after we had finalised our estimates, and we considered that the impact would have been very small in New Zealand, so we did not include it.

This list of conditions differs slightly from that used in 2004 New Zealand Burden of Alcohol report (NZBoA2000/02), with the major difference being the addition of two types of cancer (colon and rectum cancer) and two infectious diseases (tuberculosis and pneumonia). The identification and quantification of these new causal relationships with alcohol was made possible by new evidence from studies, systematic reviews and meta-analyses that have been published since the NZBoA2000/02 report. Unless otherwise indicated in Appendix A, the ICD-10 codes that correspond with each disease condition are consistent with those in the 2005 GBD Study Operations Manual.[6]

Table 3: Categories of alcohol-related (non-injury) conditions.

Condition category	ICD-10 codes	Impact of alcohol
Cancers		
Mouth and oropharyngeal cancers	C00–C14	Detrimental
Oesophagus cancer	C15	Detrimental
Colon cancer*	C18	Detrimental
Rectum cancer*	C19–C21	Detrimental
Liver cancer	C22	Detrimental
Laryngeal cancer	C32	Detrimental
Female breast cancer	C50	Detrimental
Neuro-psychiatric disorders		
Alcohol use disorders	F10	Entirely caused by alcohol
Unipolar depressive disorders	F32–F33, F34	Detrimental
Epilepsy	G40–G41	Detrimental
Cardiovascular disorders		
Hypertensive heart disease	I10–I13	Mainly detrimental
Ischaemic heart disease	I20–I25	Beneficial or detrimental
Cardiac arrhythmias	I47–I48	Detrimental
Ischaemic stroke	I60–I67,	Beneficial or detrimental
Haemorrhagic stroke	I69	Detrimental
Digestive disorders		
Oesophageal varices	I85	Detrimental
Alcoholic liver cirrhosis	K70	Entirely caused by alcohol
Cholelithiasis	K80	Beneficial
Pancreatitis	K85, K86	Detrimental
Conditions arising during pregnancy		
Low birth weight	P05–P07	Detrimental
Fetal alcohol syndrome	Q86	Entirely caused by alcohol
Respiratory disorders		
Tuberculosis*	A15–A19, B90	Detrimental
Lower respiratory infections: pneumonia*	J10–J18	Detrimental
Diabetes mellitus	E10–E14	Beneficial or detrimental

* New category added since the NZBoA2000/02 report.

Cardiovascular disorders

Stroke, ischaemic or haemorrhagic

Issue: ICD-10 codes for stroke (I60–I67, I69) do not adequately discriminate between ischaemic and haemorrhagic stroke subtypes. I69 (sequelae of cerebrovascular disease) is a particularly broad code which includes deaths that originate from both ischaemic and haemorrhagic strokes. The proportion of I69 deaths in New Zealand is substantial in relation to total stroke deaths, with I69 accounting for 13% of all stroke deaths in both 2004 and 2007. Wpr-A estimates for age-specific proportions of fatal ischaemic and haemorrhagic stroke were available from Lawes *et al*.[7] However, the Wpr-A estimates are not sex- or ethnicity-specific and the Wpr-A subregion comprised of a group of culturally and geographically disparate countries (New Zealand, Australia, Brunei Darussalam, Japan and Singapore).

Decision: We chose to calculate deaths due to ischaemic and haemorrhagic stroke subtypes by applying local estimates of fatal stroke subtype proportions to total stroke mortality data. Improvements to the broad Wpr-A estimates were made by using the calculation methods outlined by Lawes *et al.*[7] to estimate fatal stroke subtype proportions from New Zealand stroke incidence data collected by the 2002–2003 Auckland Regional Community Stroke (ARCOS) study.[8]

Feigin *et al.* provided total (fatal and non-fatal) stroke subtype incidence estimates from the ARCOS study,[8] from which we were able to derive the proportions of total ischaemic and haemorrhagic strokes for each age category (strokes of undetermined cause were excluded). These proportions were then multiplied by the 'gold standard' one-month case-fatality rates of ischaemic and haemorrhagic stroke used by Lawes *et al.* (14% and 45%, respectively),[7] and divided by the combined total of the resulting proportions to produce age-specific estimates of the relative proportions of fatal ischaemic and haemorrhagic strokes. When these age-specific calculations were performed separately by sex and ethnicity group, there were differences between sexes (higher proportions of ischaemic stroke in all age categories of men compared to women) but ethnic differences in age-specific stroke subtype proportions were minimal. For this reason, the same age- and sex-specific proportions were used for both Māori and non-Māori calculations. The age categories used by Feigin *et al.* differed from the age categories used in the present analysis, so their age category midpoints were plotted against the calculated proportion estimates for ischaemic and haemorrhagic strokes. The male and female plots both displayed a linear relationship between age and stroke proportions with excellent fit ($R \geq 0.97$), so these line formulae were used to compute sex-specific stroke subtype proportions for the midpoints of the age categories used in our analyses.

The final sex- and age-specific fatal stroke subtype proportions that were applied to total stroke (I60–I67, I69) mortality data to calculate ischaemic and haemorrhagic stroke deaths in New Zealand during 2004 and 2007 are shown in Table 4. The proportions were similar to the Wpr-A estimates[7] (see Table 5) and they varied by age and sex in a way we expected.

Table 4: New Zealand-based estimates of the proportion of fatal stroke subtypes, by age and sex.

Age group (years)	Men		Women	
	Ischaemic (%)	Haemorrhagic (%)	Ischaemic (%)	Haemorrhagic (%)
30–44	42.1	57.9	38.3	61.7
45–59	51.0	49.0	45.6	54.4
60–69	58.4	41.6	51.8	48.2
70–79	64.4	35.6	56.7	43.3

Table 5: Wpr-A subregion estimates of the proportion of fatal stroke subtypes, by age.

Age group (years)	Ischaemic (%)	Haemorrhagic (%)
30–44	41	59
45–59	48	52
60–69	53	47
70–79	60	40

Digestive disorders

Alcoholic liver cirrhosis

Issue: Many countries have problems classifying the type of liver cirrhosis due to factors such as cultural issues, stigma, and insurance policies. For this reason, AAFs must often be applied to all liver cirrhosis mortality codes that may potentially be attributable to alcohol including: K73 (chronic hepatitis, not elsewhere classified), K74 (fibrosis and cirrhosis of liver), and K70 (alcoholic liver disease). However, in New Zealand the coding system for alcoholic liver cirrhosis (K70) is thought to be reliable. In order to check this assumption, the proportion of alcoholic liver disease deaths (K70) with respect to all liver cirrhosis deaths (K70 + K73 + K74) was calculated for New Zealand. In 2004 and 2007, K70 accounted for 73% and 72% of total liver cirrhosis deaths, respectively. These large proportions indicate that there does not appear to be a reluctance to attribute liver cirrhosis to alcohol in New Zealand.

Decision: We used only K70 deaths to calculate alcohol-attributable deaths due to liver cirrhosis. This will result in a conservative estimate and is consistent with the coding used in the NZBoA2000/02 report.

Oesophageal varices

Issue: There is no GBD 2005/2010 category.

Decision: We included oesophageal varices in our analyses because a large proportion of oesophageal varices are due to liver cirrhosis. In accordance with the NZBoA2000/02 report methods, relative risks for cirrhosis of the liver (K70, K73 and K74) were used to calculate AAFs for oesophageal varices.

Alcohol-related injuries

Table 6 lists the injuries that are included in the mortality analyses of this report. Injury codes in Table **Error! Reference source not found.** are consistent with the ICD-10 codes used in the NZBoA2000/02 report with the exceptions of codes X00–X09, which were extracted from the 'Other unintentional injuries' category to create a separate 'Fire' category. This resulted in a better match with the injury categories used by Taylor *et al.*[9] in their alcohol-attributable fraction (AAF) calculations for global comparative risk assessments. Our variations from the ICD-10 codes used by Taylor *et al.*[9] in their injury categories are detailed in Appendix B.

Table 6: Categories of alcohol-related injuries.

Injury category	ICD-10 codes	Impact of alcohol
Unintentional injuries		
Road traffic injuries	V02–V04, V09, V12–V14, V19–V79, V86–V89, Y32, Y85	Detrimental
Alcohol poisonings	X45, X65,* Y15	
Non-alcohol poisonings	X40–X44, X46–X49, Y10–Y14, Y16–Y18	Detrimental
Falls	W00–W19, Y30–Y31	Detrimental
Fires†	X00–X09	Detrimental
Drownings	W65–W74, Y21	Detrimental
Other unintentional injuries	V01, V05–V06, V10–V11, V15–V18, V80–V85, V90–V99, W20–W64, W75–W99, X10–X39, X50–X59, Y19–Y20, Y22–Y29, Y86	Detrimental
Intentional injuries		
Self-inflicted injuries	X60–X64, X66–X84	Detrimental
Assault	X85–Y09	Detrimental
Other intentional injuries	Y35, Y87	Detrimental

* X65 deaths (intentional self-poisoning by and exposure to alcohol) were too uncommon to warrant their own injury category, so they were included in the 'unintentional alcohol poisoning' category for simplicity.
† New category added since NZBoA2000/02 report.

Injuries of undetermined intent

Issue: The proportion of injuries recorded as 'undetermined intent' varies between countries.

Decision: In New Zealand, very few deaths were attributed to injuries of undetermined intent (21 deaths and 23 deaths in 2004 and 2007, respectively). We have therefore chosen to include these deaths in the injury analyses in the interest of completeness (see Appendix B for details).

MORTALITY AND ALCOHOL CONSUMPTION DATA

Population subgroups examined

Age groups

All of the analyses in this report categorise the population into seven age groups: 0–4 years, 5–14, 15–29, 30–44, 45–59, 60–69, and 70–79. These age categorisations were chosen to be consistent with the groups used by the World Health Organization (WHO). We did not estimate mortality or the burden of disease and injury for people aged 80 years and older due to the unreliability of the estimates of both relative risks and alcohol consumption for this age category.

Ethnicity classification (Māori/non-Māori)

This report has endeavoured to take an approach consistent with the Treaty of Waitangi by conducting separate analyses for Māori and non-Māori where possible. Mortality analyses were performed for Māori and non-Māori separately, with no other ethnic groups differentiated in these analyses.

Denominator populations used in the calculation of rates are those derived for the appropriate year by Statistics New Zealand from Census data. They rely on self-identification of ethnicity, and a hierarchy of ethnic groups when multiple ethnic group affiliations are identified, to establish membership of the Māori ethnic group. Thus, any person identifying with the Māori ethnic group is classified here as Māori, and all others as non-Māori.

Numerator mortality data are from Statistics New Zealand for 2004 and 2007, which also uses self-identification of ethnicity to establish prioritised ethnicity. In the past (1991–1994), mortality data have been shown to underestimate Māori mortality due to data collection methods that resulted in high levels of misclassification.[10,11] However, a recent New Zealand Census-Mortality Study update comparing 2001–2004 mortality and census data demonstrated close agreement between ethnic group counts when either the 'total' or 'prioritised' definitions of ethnicity were used.[12] This suggests that the ethnic mortality rates calculated in this report should have little numerator-denominator bias.

Burden of disease and injury estimates (DALYs) were calculated for the total New Zealand adult population due to the lack of ethnicity-specific burden data available from the WHO Global Burden of Disease study.

New Zealand data

Mortality

Statistics New Zealand mortality data for the 2004 and 2007 New Zealand population were obtained by sex, age group and ethnicity (Māori/non-Māori). Statistics New Zealand used prioritised ethnicity to determine ethnicity from death registration data where people identified with multiple ethnic groups.[13,14] Therefore, all people who were identified as Māori (by funeral directors on the advice of family members or other person assisting with the death registration) were classified as Māori, and the non-Māori population included everyone else. Mortality data were defined by three-digit ICD-10 codes (International Classification of Diseases), with each death assigned to a single underlying

cause. This simplistic categorisation of deaths is a practical solution used by the GBD 2005/2010 study despite the fact that deaths are often the result of more complex multicausal pathways.

Alcohol consumption categories used for analyses

Alcohol-related conditions (excluding ischaemic heart disease and injuries)

The categories of average daily alcohol consumption used for the 2004 and 2007 analyses of alcohol-related conditions in this report are based on the work of English *et al.*,[15] and are consistent with those used in the previous NZBoA2000/02 report[1] and several other global and national burden analyses.[16-19] The cut points for the categories differ between men and women to reflect the fact that women often experience higher risks of disease with lower levels of average alcohol consumption.

It has been recognised that ex-drinkers and lifetime abstainers have different risks of alcohol-related disease and therefore differentiating between these two subgroups of abstainers is necessary for estimating both the detrimental and beneficial effects of average alcohol consumption.[2] Instead of including all current abstainers together in a single category, as was the case in the previous report, this analysis included ex-drinkers and lifetime abstainers as separate alcohol consumption categories.

Units: grams of pure alcohol per day.

Lifetime abstainers:	0	
Ex-drinkers:	0	
Drinking category I:	Women 0.01–19.99	Men 0.01–39.99
Drinking category II:	Women 20–39.99	Men 40–59.99
Drinking category III:	Women 40+	Men 60+

Ischaemic heart disease

In comparison to the alcohol consumption categories used for analyses of other non-injury conditions, the ischaemic heart disease analyses required more refined alcohol consumption categories. Identical average alcohol consumption categories were used for both women and men, and proportions of drinkers with *irregular* heavy drinking occasions (60+ grams of pure 'alcohol per occasion' *at least monthly, but not daily*) were also calculated for each average consumption category. The categories for both women and men are as follows:

Units: grams of pure alcohol per day.
HDOs = heavy drinking occasions

Lifetime abstainers:	0	
Ex-drinkers	0	
Drinking category Ia:	0.01–19.99	
Drinking category Ib:	0.01–19.99	(*irregular* HDOs)
Drinking category IIa:	20–39.99	
Drinking category IIb:	20–39.99	(*irregular* HDOs)
Drinking category IIIa:	40–59.99	
Drinking category IIIb:	40–59.99	(*irregular* HDOs)
Drinking category IV:	60+	(*regular* HDOs)

Injuries

Please see Appendix C for details about the alcohol consumption categories used by the GBD 2010 Risk Factors Collaborating Group to calculate injury alcohol-attributable fractions for use in our injury sensitivity analysis.

Alcohol consumption estimates

Average daily alcohol consumption

A number of surveys have collected data on the prevalence of alcohol consumption in the New Zealand population since the previous 'Burden of death, disease and disability due to alcohol in New Zealand report' (NZBoA2000/02), including: 2003/04 Health Behaviours Survey – Alcohol Use (HBS2003/04);[20] Te Rau Hinengaro: 2003/04 New Zealand Mental Health Survey (NZMHS2003/04);[21] 2006/07 New Zealand Health Survey (NZHS2006/07);[22] 2007 Gender, Alcohol and Culture: An International Survey – New Zealand (GENACIS2007);[23,24] 2007/08 New Zealand Alcohol and Drug Use Survey (NZADUS2007/08);[25] and 2008/09 SHORE's Harm to Others Survey (HtO2008/09) conducted by the Centre for Social and Health Outcomes Research and Evaluation (SHORE) and Te Ropu Whariki (Massey University).[26]

Our analyses required estimates of the average grams of pure alcohol consumed per day, so we were unable to use data from surveys that collected information about alcohol consumption data if it could not be converted into these units (i.e. Alcohol Use Disorders Identification Test questions were used for NZHS2006/07 and half of the NZMHS2003/04 survey participants, while the survey questions used for the other half of NZMHS2003/04 participants resulted in only approximate estimates of alcohol consumption).[21,22] Although it was possible to estimate average alcohol consumption from the GENACIS2007 survey data, we chose not to include GENACIS estimates in our analyses due to the relatively small sample size (N = 1,925).[23]

We used data from HBS2003/04 and NZADUS2007/08 to estimate the unadjusted prevalence of alcohol consumption categories by age, sex and ethnicity in 2004 and 2007, respectively. However, these surveys only included participants up to age 65 years. Therefore, calculations for the extrapolation of alcohol consumption prevalence estimates to the older age categories also included survey data from HtO2008/09 (see 'Alcohol consumption estimates for older age categories' starting on page 26 for details and rationale for these extrapolation methods). The 2004 and 2007 estimates for the average daily volume of alcohol consumption by age/sex/ethnicity subgroups are shown in Tables 7-10.

As detailed in the following text, several methodological differences exist between the two main surveys used for estimating alcohol consumption in this report (HBS2003/04 and NZADUS2007/08). The different methods used for survey participant selection, interviewing, and ethnicity determination mean that comparisons between the 2004 and 2007 prevalence of alcohol consumption in age/sex/ethnic subgroups of New Zealanders may not reflect only differences in consumption.

Table 7: Estimated average volume of alcohol consumption for Māori and non-Māori males (%), New Zealand 2004.

			Age group (years)*				
	Alcohol consumption category	**Grams alcohol per day**	**15–29†**	**30–44†**	**45–59†**	**60–69‡**	**70–79‡**
Māori males	Abstainers	0	10.1	4.8	5.5	3.0	2.5
	Ex-drinkers	0	4.3	12.1	18.9	20.1	20.3
	I	0.01–39.99	52.0	66.5	64.0	65.4	68.8
	II	40.00–	9.6	6.8	5.5	3.6	2.2
	III	60+	24.0	9.9	6.2	7.9	6.2
Non-Māori males	Abstainers	0	10.2	4.9	5.4	5.5	7.2
	Ex-drinkers	0	2.8	5.0	7.7	8.7	9.7
	I	0.01 –	58.5	75.9	73.2	74.0	73.1
	II	40.00–	8.5	7.9	6.5	6.2	5.6
	III	60+	20.1	6.4	7.3	5.6	4.3

* Sums of age/sex/ethnicity subgroup proportions may not equal exactly 100% due to rounding.
† Estimates from HBS2003/04.
‡ Extrapolated estimates from weighted averages of proportions from HBS2003/04, NZADUS2007/08 and HtO2008/09 surveys. See following report section: 'Alcohol consumption estimates for older age categories' for details about calculation methods and limitations of extrapolated estimates (i.e. high degree of uncertainty).

Table 8. Estimated average volume of alcohol consumption for Māori and non-Māori females (%), New Zealand 2004.

			Age group (years)*				
	Alcohol consumption category	**Grams alcohol per day**	**15–29†**	**30–44†**	**45–59†**	**60–69‡**	**70–79‡**
Māori females	Abstainers	0	8.2	8.8	13.6	11.3	11.3
	Ex-drinkers	0	7.7	17.7	19.2	31.0	44.4
	I	0.01–	53.1	58.7	55.3	50.3	44.3
	II	20.00–	13.5	8.5	5.8	6.1	0.0
	III	40+	17.6	6.3	6.2	1.3	0.0
Non-Māori females	Abstainers	0	12.1	8.7	10.6	13.0	19.5
	Ex-drinkers	0	4.6	5.4	5.4	11.2	12.3
	I	0.01–	62.0	70.6	68.1	65.0	60.1
	II	20.00–	13.1	10.8	12.1	8.3	6.5
	III	40+	8.2	4.5	3.8	2.5	1.6

* Sums of age/sex/ethnicity subgroup proportions may not equal exactly 100% due to rounding.
† Estimates from HBS2003/04.
‡ Extrapolated estimates from weighted averages of proportions from HBS2003/04, NZADUS2007/08 and HtO2008/09 surveys. See following report section: 'Alcohol consumption estimates for older age categories' for details about calculation methods and limitations of extrapolated estimates (i.e. high degree of uncertainty).

Table 9. Estimated average volume of alcohol consumption for Māori and non-Māori males (%), New Zealand 2007.

	Alcohol consumption category	Grams alcohol per day	Age group (years)*				
			15–29†	30–44†	45–59†	60–69‡	70–79‡
Māori males	Abstainers	0	1.3	1.1	1.2	3.0	2.5
	Ex-drinkers	0	5.8	9.2	27.2	20.1	20.3
	I	0.01–39.99	60.2	63.4	53.7	65.4	68.8
	II	40.00–59.99	8.5	9.9	6.0	3.6	2.2
	III	60+	24.2	16.4	11.9	7.9	6.2
Non-Māori males	Abstainers	0	6.5	2.7	2.8	5.5	7.2
	Ex-drinkers	0	8.0	7.7	9.4	8.7	9.7
	I	0.01–39.99	64.4	70.8	76.4	74.0	73.1
	II	40.00–59.99	4.8	9.5	5.0	6.2	5.6
	III	60+	16.2	9.2	6.3	5.6	4.3

* Sums of age/sex/ethnicity subgroup proportions may not equal exactly 100% due to rounding.
† Estimates from NZADUS2007/08.
‡ Extrapolated estimates from weighted averages of proportions from HBS2003/04, NZADUS2007/08 and HtO2008/09 surveys. See following report section: 'Alcohol consumption estimates for older age categories' for details about calculation methods and limitations of extrapolated estimates (i.e. high degree of uncertainty).

Table 10: Estimated average volume of alcohol consumption for Māori and non-Māori females (%), New Zealand 2007.

			Age group (years)*				
	Alcohol consumption category	**Grams alcohol per day**	**15–29†**	**30–44†**	**45–59†**	**60–69‡**	**70–79‡**
Māori females	Abstainers	0	1.8	2.7	2.5	11.3	11.3
	Ex-drinkers	0	10.9	13.6	21.4	31.0	44.4
	I	0.01–19.99	53.5	64.9	66.2	50.3	44.3
	II	20.00–39.99	12.4	9.9	3.2	6.1	0.0
	III	40+	21.4	8.8	6.7	1.3	0.0
Non-Māori females	Abstainers	0	9.0	6.6	5.8	13.0	19.5
	Ex-drinkers	0	9.8	10.6	10.3	11.2	12.3
	I	0.01 – 19.99	63.4	69.2	68.8	65.0	60.1
	II	20.00–39.99	7.8	8.5	10.2	8.3	6.5
	III	40+	9.9	5.0	4.8	2.5	1.6

* Sums of age/sex/ethnicity subgroup proportions may not equal exactly 100% due to rounding.
† Estimates from NZADUS2007/08.
‡ Extrapolated estimates from weighted averages of proportions from HBS2003/04, NZADUS2007/08 and HtO2008/09 surveys. See following report section: 'Alcohol consumption estimates for older age categories' for details about calculation methods and limitations of extrapolated estimates (i.e. high degree of uncertainty).

2003/04 Health Behaviours Survey – Alcohol Use (HBS2003/04)

HBS2003/04 was a cross-sectional population survey implemented by the Centre for Social and Health Outcomes Research and Evaluation (SHORE), with funding from the New Zealand Ministry of Health.[20] It was conducted from September 2003 to August 2004 using an in-house computer-assisted telephone interviewing system.

A stratified random sampling design based on the level of urbanisation and geographic regions was used. The three sample frames used to obtain full coverage of the New Zealand population and an increased sample of Māori respondents were: random digit dialling samples from both the general population (5,469 non-Māori; 840 Māori) and a Māori screened sample (676 Māori), and a sample from the full electoral roll of people with self-identified Māori ancestry (2,862 Māori). At least 10 attempts were made to contact each randomly selected telephone number, and for each individual within a household a further random selection was used to determine if they were to participate in the survey.

Data were collected from 9,847 New Zealand residents (4,378 Māori and 5,469 non-Māori) aged 12–65 years living in private residential dwellings with a connected landline phone (overall weighted response rate 59%).

To determine ethnicity, respondents were asked to identify a maximum of two ethnic groups to which they belonged. Māori versus non-Māori ethnicity was determined using prioritised ethnicity, so that all respondents who selected Māori as one of their ethnic groups were classified as Māori, while all other respondents were classified as non-Māori.

Further details about the HBS2003/04 survey methods are described elsewhere.[20]

2007/08 New Zealand Alcohol and Drug Use Survey (NZADUS2007/08)

NZADUS2007/08 was a cross-sectional population survey implemented by the Ministry of Health.[25] It was conducted from August 2007 to April 2008 using face-to-face computer-assisted personal interviews in respondents' homes, with the sensitive questions about personal patterns of alcohol use self-completed by the participants on a laptop computer using audio prompts.

A multi-stage, stratified, probability proportional to size random sampling design based on lists of addresses within 2006 Census meshblocks was used (adjusted so that meshblocks with higher concentrations of Māori and Pacific people had a greater chance of selection). Increased sampling of Māori respondents was primarily achieved through a Māori and Pacific screened sample (households with at least one adult of Māori or Pacific ethnicity). Up to eight attempts were made to contact each randomly selected household, and the Kish grid method[27] was used to select one eligible adult (if any) from each household.

Data were collected from 6,784 New Zealand residents (1,825 Māori and 4,959 Non-Māori) aged 16–64 years living in private residential dwellings (final weighted response rate 60%).

For selection of eligible adults in each household, the Statistics New Zealand Census 2006 ethnicity question was used to obtain the ethnicities of household members by proxy from the person who answered the door. Total response ethnicity was considered for each survey participant with each person allocated to all ethnic groups they identified with, so that the total number of survey responses for all ethnicities is greater than the total number of survey participants.[28] This means that there is some overlap in the survey participants who comprise the Māori and non-Māori subgroups, as people who reported both Māori and non-Māori ethnic groups are counted once in each group.

Further details about the NZADUS2007/08 survey methods are available elsewhere.[29]

Alcohol consumption estimates for older age categories

Data sources

There is little alcohol consumption data available for older New Zealand residents and they comprise a relatively small proportion of the population. Moreover, the surveys that do include people from older age groups only obtain data from individuals who live in private dwellings, thereby excluding the substantial proportion of older people who live in institutions and that are likely to have very different alcohol consumption patterns. Despite these data constraints, it is important to include older people in this analysis in order to account for the impact of alcohol on conditions that are common causes of mortality and morbidity in older people, such as cardiovascular disorders.

The HBS2003/04 and NZADUS2007/08 surveys did not include people over 65 years of age. Due to this limitation of our main datasets, directly measured alcohol consumption prevalence estimates were not available for the two oldest age categories examined in this report: 60–69 years and 70–79 years. It was therefore necessary to incorporate additional survey data and methods to estimate the prevalence of alcohol consumption in older age groups.

Estimates for alcohol consumption of older age groups were derived by combining and extrapolating from the best data that were available for New Zealand from 2004 onwards. HtO2008/09[a] included people up to 80 years of age, but the Māori estimates were based on very small sample sizes and must therefore be interpreted with caution. NZMHS2003/04 and NZHS2006/07 both included older survey participants and provided estimates for the prevalence of abstainers in older age groups. However, the AUDIT survey questions used for all NZHS2006/07 participants and half of the NZMHS2003/04 participants did not allow for the calculation of average alcohol consumption, while the survey questions used for the other half of NZMHS2003/04 participants allowed only for rough estimates of alcohol consumption.

[a] A cross-sectional general population survey conducted by the Centre for Social and Health Outcomes Research and Evaluation (SHORE) in 2008/09.[26] An in-house computer-assisted telephone interviewing system was used to collect data from 3,068 New Zealand residents aged 12–80 years (response rate 64%).

The HtO2008/09 survey was conducted after 2007, meaning that the HtO2008/09 alcohol exposure data does not temporally precede the years for which the alcohol-related health outcome data were analysed (2004 and 2007). However, alcohol consumption in New Zealanders aged 16–64 years has been shown as reasonably stable between 2000 and 2004,[30] and 2004 and 2007.[25] It is therefore likely that there would be a similar stability in alcohol consumption by older drinkers across 2004 and 2007 and extending to 2008/09. Based on this assumption and the limitations of available survey data (described above), we decided to extrapolate older age prevalence estimates by combining data from HBS2003/04, NZADUS2007/08 and HtO2008/09. Older age category estimates from NZHS2006/07 and NZMHS2003/04 were used only for qualitative comparisons.

Estimation method

For age groups up to and including 60–69 years, overall prevalence estimates were calculated for each age/sex/ethnicity subgroup by combining weighted estimates from HBS2003/04, NZADUS2007/08 and HtO2008/09, with weights proportional to survey sample sizes. The 70–79 year estimates were used directly from HtO2008/09 since it was the only survey with average alcohol consumption data for this older age group.

These weighted prevalence estimates were then plotted against their age group midpoints, and theoretically plausible best fit curves were determined for each alcohol consumption category within a given sex/ethnicity subgroup. Prevalence estimates for the older age categories were then calculated from each best fit model using age category midpoints and finally adjusted so that the sum of prevalence estimates for all alcohol consumption levels was 100% for each age category.

The same older age extrapolated estimates were used for 2004 and 2007 data because the plots used to derive the estimates were based on weighted averages derived from 2003/04, 2007/08 and 2008/09 survey datasets. As previously mentioned, alcohol consumption levels in older age groups were most likely constant between 2004 and 2007. It was therefore important to avoid introducing artificial differences between these years by calculating different estimates for older age groups, especially given the degree of uncertainty inherent in any extrapolation method.

Results

The extrapolated estimates of alcohol consumption prevalence in older age categories (shown in the final two columns of Tables 7-10) are largely consistent with the abstainer data available from NZHS2006/07 and NZMHS2003/04, and broadly similar to the older age estimates of the NZBoA2000/02 report which were based on combining data from five New Zealand studies.[1] They are, however, only rough approximations of alcohol consumption in the older age categories. Although we have accepted this limitation in order to calculate estimates of the burden of alcohol for New Zealanders in older age categories, it is important to emphasise the high degree of uncertainty surrounding the estimates for older age categories, both in these prevalence tables and in the other estimates and results presented for 60–69 and 70–79 year olds throughout this report.

Alcohol consumption estimates for pregnant women

The NZBoA2000/02 report based its estimates of alcohol consumption during pregnancy on a survey of women who were registered with a specific Wellington maternity care provider.[31] At 20–24 weeks of

gestation, the proportion of abstainers versus drinkers was determined by asking about alcohol consumption during the previous week.[31]

Since publication of the NZBoA2000/02 report, several new surveys and studies have measured alcohol consumption in pregnant New Zealand women.[20,25,32,33] Most of the studies used population-based stratified sampling methods with increased sampling of the Māori population, and data collection was conducted by telephone or face-to-face[25] interviews. Due to sample size limitations, separate estimates for alcohol consumption during pregnancy by Māori and non-Māori women were only available from NZADUS2007/08,[25] while other studies simply stated that there were no significant differences between the proportions of New Zealand Māori and New Zealand European[32] or New Zealand non-Māori[20] women who drank any alcohol during their pregnancies. See Appendix D for a summary of survey sample sizes and response rates.

Two studies asked women about their alcohol consumption while they were still pregnant[20] or immediately postpartum,[33] while the others also included retrospective data about drinking during each woman's most recent pregnancy within the previous three[25] or five[32] years. The self-reported survey questions used in these studies also varied substantially in terms of the detail collected about the volume and pattern of drinking and the timing of alcohol consumption during the pregnancy. The Ministry of Health's Alcohol Use in New Zealand surveys (HBS2003/04 and NZADUS2007/08) asked general questions about drinking during pregnancy. The 2003/04 Health Behaviours Survey asked women who were currently pregnant whether they drank alcohol before their pregnancy (73.9% of drinkers) and then asked the drinkers whether they had changed their way of drinking during their pregnancy (23.5% of drinkers had not stopped drinking).[20] The 2007/08 New Zealand Alcohol and Drug Use Survey asked, "At any time when you were pregnant in the last three years, did you have alcohol, even once?" (28.4% answered "yes").[25] More detailed information was collected by a 2005 Alcohol in Pregnancy study that differentiated between pregnant women who only drank before realising they were pregnant (13.0%) versus those who drank some alcohol despite knowing they were pregnant (39.6%).[32] Detailed information on drinking volume, drinking patterns, and timing of reduction in alcohol use during pregnancy was also collected by a Taranaki study of 100 immediately postpartum women, with 28% of the women reporting some consumption of alcohol during their pregnancy.[33]

Due to these different methods used to measure alcohol consumption during pregnancy, the overall estimated proportions of New Zealand women who drank some alcohol during pregnancy vary widely from 17.4% to 52.6% and are not directly comparable with each other.[20,32,33] Further complicating this issue is the scientific uncertainty that remains with regard to the specific timing and mechanism of alcohol's impact on the maternal and perinatal conditions of interest in this report (i.e. low birth weight and fetal alcohol syndrome).[34]

Estimates of drinking pattern as measured by the frequency of heavy drinking occasions (i.e. binge drinking episodes) in New Zealand women during pregnancy were provided by Parackal *et al.*,[32] who used ALAC's definition of binge drinking for women under 18 years (5+ drinks at any one time) and 18 years and older (7+ drinks at any one time). This study showed that, while only 2.2% of women reported at least one heavy drinking occasion (HDO) after becoming aware of their pregnancy, an

additional 17.6% reported HDOs before realising they were pregnant.[32] Women in the youngest age group (16–24 years) had significantly higher odds of HDOs during pregnancy than women of the older age categories.[32] Nine of the women in Ho and Jacquemard's study group of 100 women reported HDOs (defined as 4+ drinks on one occasion) during pregnancy, with five women reporting that they drank three or more drinks on a typical drinking day during their pregnancy.[33]

As outlined in the NZBoA2000/02 report,[1] drinking pattern (i.e. frequency of HDOs) is generally believed to be a more significant factor than average alcohol consumption when considering the adverse impact of drinking on pregnancy outcomes. However, it remains unclear precisely which combination of alcohol exposures (i.e. volume, pattern and/or timing of alcohol consumption during pregnancy) is most important in terms of alcohol's impact on fetal development.[34] In the global comparative risk assessment, the relative risk estimates derived from the best evidence currently available for the impact of alcohol on preterm birth complications are based on average daily alcohol consumption levels during pregnancy, with moderate (20–39.99 g) and heavy (40+ g) drinking increasing the risk of low birth weight (J. Rehm, personal communication).

We chose to use the NZADUS2007/08 prevalence estimates for average alcohol consumption during pregnancy for both 2004 and 2007 calculations for several reasons including: (1) Māori/non-Māori prevalence estimates were available; (2) prevalence estimates for age subgroups were available; and (3) estimates were based on a large nationally representative sample of pregnant women (n = 948). These estimates were similar to those reported by Ho and Jacquemard[33] and to the estimates used in the NZBoA2000/02 report (McLeod *et al.*).[31] The NZADUS2007/08 survey question differentiated between women who had abstained from consuming alcohol during pregnancy and women who had consumed any alcohol while pregnant. When Parackal *et al.* specifically asked women to also report whether they had consumed alcohol before realising they were pregnant, more than half of all women admitted to drinking during their pregnancies.[32] Parackal *et al.* also noted that younger women (16–24 years) were approximately twice as likely as women in any of the older age groups to consume alcohol before realising they were pregnant.[32] Although this indicates that the NZADUS2007/08 may have underestimated the total prevalence of all levels and types of drinkers during pregnancy (especially for the youngest age category), the NZADUS2007/08 probably captured more drinkers than some other surveys (e.g. HBS2003/04) by specifically asking if the women had alcohol *even once* during pregnancy.

In keeping with the methods used in the NZBoA2000/02 report, the overall proportions of women who drank during pregnancy were divided across the three alcohol consumption categories according to the distribution of alcohol consumption levels amongst women drinkers in the general New Zealand population. Age/ethnicity subgroup proportions for this purpose were calculated from weighted averages of HBS2003/04, NZADUS2007/08 and HtO2008/09 estimates. The adjusted estimates for alcohol consumption during pregnancy are shown in Table11.

Table 11: Estimated average volume of alcohol consumption during pregnancy for Māori and non-Māori females (%), New Zealand 2004 and 2007.[*]

	Alcohol consumption category	Grams alcohol per day	Age group (years)		Total
			15–29	30–44	15–44
Māori females	**Abstainers**	0	69.9	67.7	**68.9**
	I	0.01–19.99	18.6	25.3	**21.1**
	II	20.00–39.99	4.6	3.9	**4.2**
	III	40+	6.9	3.1	**5.8**
Non-Māori females	**Abstainers**	0	76.9	69.0	**72.2**
	I	0.01 – 19.99	17.5	25.6	**22.1**
	II	20.00 – 39.99	3.0	3.6	**3.4**
	III	40+	2.6	1.8	**2.4**

[*] Estimates based on NZADUS2007/08 data, with distribution amongst the three alcohol consumption categories determined from weighted averages of HBS2003/04, NZADUS2007/08, and HtO2008/09 proportions for the general female population in each exposure group. Sums of age/ethnicity subgroup proportions may not equal exactly 100% due to rounding. See text for calculation details.

Prevalence of people with irregular heavy drinking occasions

Recent meta-analyses have established more refined approaches for calculating the complicated risk relationships between alcohol consumption and ischaemic heart disease.[35-37] These analyses clearly demonstrate the importance of considering both the pattern and volume of alcohol consumption,[35] and of separating ex-drinkers from the abstainer reference category when calculating the effects of alcohol consumption on ischaemic heart disease.[36-37] The data required to perform these calculations for the New Zealand population are described below. For details of the calculation methods, please see the 'Methodological developments: Ischaemic heart disease' section of this report (page 68).

Table 12 summarises the nine drinking categories for which prevalence data were required to facilitate the ischaemic heart disease calculations. In contrast to the sex-specific alcohol consumption categories that were used to calculate AAFs for other alcohol-related conditions, in the case of ischaemic heart disease the same four alcohol consumption categories were used for both males and females, and the proportions of drinkers with *irregular* heavy drinking occasions (60+ g of pure alcohol per occasion *at least monthly, but not daily*) were calculated for each average consumption category.

Table 12: Categories of alcohol consumption data required for ischaemic heart disease AAF calculations.[*]

Alcohol consumption category	Grams alcohol per day	Irregular heavy drinking occasions?[†]
Abstainers	0	n/a
Ex-drinkers	0	n/a
Ia	0.01 – 19.99	No
Ib	0.01 – 19.99	Yes
IIa	20.00 – 39.99	No
IIb	20.00 – 39.99	Yes
IIIa	40.00 – 59.99	No
IIIb	40.00 – 59.99	Yes
IV	60+	n/a‡

[*] These prevalence estimates were obtained by age for all four sex/ethnicity subgroups.
[†] 60+ g of pure alcohol per occasion at least monthly, with an average alcohol consumption of less than 60 g per day.
[‡] All *regular* heavy drinkers.

Prevalence data for the drinking categories outlined in Table 12 were obtained from HBS2003/04 and NZADUS2007/08 for 2004 and 2007 calculations, respectively. For women, NZADUS2007/08 measured the frequency of irregular heavy drinking occasions (HDOs) using 40+ g pure alcohol per occasion as the cut off rather than 60+ g. This may result in some overestimation of heavy drinking occasions for women where these NZADUS2007/08 data are applied.

Sample size weighted averages from HBS2003/04, NZADUS2007/08 and HtO2008/09 were used to extrapolate prevalences for the older age categories in each sex/ethnicity subgroup using the steps previously described in the 'Alcohol consumption estimates for older age categories' section (page 26). These extrapolated estimates for older age categories therefore also share the high level of uncertainty previously discussed in the 'Alcohol consumption estimates for older age categories' section.

Estimates of the overall proportion of people with irregular HDOs within each of the four sex/ethnicity subgroups were also required in order to adjust our data relative to the reference population used for estimating the relative risks. Since the surveys we used did not include older people, we could not use survey sample sizes to calculate the overall sex/ethnicity subgroup proportions of people with irregular HDOs. For each sex/ethnicity subgroup, the age distribution of the survey participants from 15 to 59 years old was broadly similar to actual New Zealand population data. Therefore, in order to calculate the overall proportions of people with irregular HDOs for each sex/ethnicity subgroup, we applied the survey proportions of people with irregular HDOs in each age category (including the proportions extrapolated for the older age categories) to the actual numbers of New Zealanders in that age category for 2004 and 2007. Please see Table E-1 and Table E-2 in Appendix E for the

proportions of people with irregular HDOs in the meta-analysis studies (ie reference population) and New Zealand sex/ethnicity subgroups, respectively. Appendix E also provides the alcohol consumption prevalences for each New Zealand age/sex/ethnicity subgroup, with excess proportions of people with irregular HDOs extracted from each category for the application of ischaemic heart disease relative risks (Table E-3 and Table E-7).

Heavy drinking occasions

The following drinking pattern estimates were used by the Global Burden of Disease 2010 Risk Factors Collaborating Group to calculate injury alcohol-attributable fractions for our injury sensitivity analysis: 'prevalence of people with heavy drinking occasions'; 'average number of heavy drinking occasions per week'; and 'average number of drinks per heavy drinking occasion' (see Appendix C for this data and more details).

Adult per capita alcohol consumption

National adult per capita alcohol consumption data derived from aggregate production, sales, export and import statistics are commonly regarded as the most accurate estimates for the overall volume of alcohol consumption in a country.[38,39] However, our analyses required disaggregated estimates (i.e. by age/sex/ethnicity subgroups) that were only available from survey data. Most national alcohol surveys markedly underestimate alcohol use relative to the national taxable alcohol available for consumption, therefore requiring some method of adjustment so that the survey results are more in line with the overall national level of per capita alcohol consumption.[38] However, adjustment of survey estimates is not considered necessary when survey coverage rates are 80% or greater (J. Rehm, personal communication). Therefore, we examined the validity of our survey-based estimates of average alcohol consumption by calculating the overall coverage rates for the surveys compared to the taxable alcohol available for consumption during the same year. The derivation and limitations of the Statistics New Zealand estimates of taxable alcohol available for consumption have been discussed in detail elsewhere.[39-41]

The annual volumes of alcohol consumed by the total New Zealand population aged 15 years and older in 2004 and 2007 were estimated from the volumes of alcohol consumption reported by drinkers in the HBS2003/04 and NZADUS2007/08 surveys. For New Zealanders in the older age groups that were not captured by these surveys, extrapolated alcohol consumption estimates derived from a combination of survey data were used (see the 'Alcohol consumption estimates for older age categories' section on page 26 for a detailed description of extrapolation methods). Per capita consumption was then calculated by dividing the 2004 and 2007 estimates of annual alcohol consumption volume by the total New Zealand resident population aged 15 years and over, using Statistics New Zealand estimates as at 30 June of 2004 and 2007.

The overall per capita alcohol consumption estimates calculated from HBS2003/04 and NZADUS2007/08 data was 8.3 litres[a] in both 2004 and 2007. Statistics New Zealand reported the volume of pure alcohol available per head of population aged 15 years and over in New Zealand as 9.2 litres[a] in 2004[40] and 2007.[41] Due to the high coverage rates of our survey-based alcohol consumption estimates (i.e. both approximately 90%), we did not adjust them for our analyses.

[a] Rounded to two significant digits.

MORTALITY ALCOHOL-ATTRIBUTABLE FRACTIONS (AAFS)

For each alcohol-related condition and injury identified in Tables 3 and 6, the contribution of alcohol consumption to mortality in New Zealand was quantified by calculating alcohol-attributable fractions (AAFs) for each age/sex/ethnicity subgroup. The mortality alcohol attributable fraction (AAF) is the proportion of deaths due to a specific condition or injury that would be prevented in a given subgroup if alcohol consumption was eliminated. This can also be referred to as the population attributable fraction (PAF) or population attributable risk (PAR) due to alcohol. For example, for a specific condition and subgroup, an AAF of 20% means that 20% of the subgroup's deaths due to that condition would be eliminated if nobody in that subgroup had ever consumed alcohol. It must be recognised that, even if the entire New Zealand population were to suddenly stop consuming alcohol, the increased mortality risk of ex-drinkers compared to lifetime abstainers for many chronic conditions means that the mortality risk due to alcohol consumption would not be completely eliminated. Negative AAFs are also possible when alcohol consumption is protective for a given condition and subgroup. This method of quantifying the contribution of alcohol to New Zealand's mortality burden is a necessary simplification, as most conditions and injuries are caused by multiple overlapping and interacting risk factors.

Both average volume of alcohol consumption and episodes of intoxication have been shown to influence alcohol-related burden of disease. Therefore the way in which the AAF for each condition is estimated depends on whether the condition is due to acute or chronic use of alcohol and whether the pattern of drinking has been established as an important determinant of the incidence of the condition. In all cases the estimation of risk is made by comparison of ex-drinkers or drinkers (at various levels) with abstainers. That is, zero is the theoretical minimum exposure to alcohol.

The effect of pattern of drinking may be underestimated in many conditions, as pattern information has not been routinely collected in epidemiological studies. Conditions where the pattern of consumption has been demonstrated to have an effect independently of average volume of alcohol are ischaemic heart disease, fetal alcohol syndrome, unintentional injuries and intentional injuries.[2]

AAF calculation methods (by age/sex/ethnicity)

AAFs for wholly alcohol-attributable conditions and injuries

As shown in Tables 3 and 6, several conditions and injuries are entirely caused by the consumption of alcohol: alcohol use disorders, alcoholic liver cirrhosis, fetal alcohol syndrome, and alcohol poisoning. By definition, these conditions and injuries all have AAFs of 100 percent.

AAFs for partially alcohol-attributable conditions

AAFs for most of the partially alcohol-attributable conditions listed 3 were calculated as a function of the prevalence of each drinking category in each age/sex/ethnicity subgroup and the relative risks for each drinking category compared to lifetime abstainers. The drinking categories used in these AAF calculations were based on estimates of the average daily volume of alcohol consumed, and ex-drinkers were separated from lifetime abstainers (see Tables 7–10). Therefore, the following formula is suitable for conditions where drinking pattern has not been shown to impact the risk of mortality:

$$AF_i = \frac{p_i(RR_i - 1)}{\sum_{i=0}^{k} p_i(RR_i - 1) + 1} \quad (1)$$

where,

i = the average daily alcohol consumption category (0 = the referent abstainer category)
k = the number of alcohol consumption categories
AF_i = population attributable fraction for a specific alcohol consumption category
p_i = prevalence of alcohol consumption for category i
RR_i = the risk of mortality at alcohol consumption category i compared to abstainers

For each condition, the overall AAF for all categories of alcohol consumption was calculated for each age/sex/ethnicity subgroup by summing the AF_i across all alcohol consumption categories.

AAFs were calculated using equation 1 (with k = 4) for all cancers, epilepsy, hypertensive heart disease, cardiac arrhythmias, ischaemic and haemorrhagic strokes, oesophageal varices, cholelithiasis, pancreatitis, tuberculosis, lower respiratory infections, and diabetes mellitus.

Since drinking prior to pregnancy has not been shown to influence birth weight, ex-drinkers and lifetime abstainers were grouped together in a single category for the calculation of low birth weight AAFs. The prevalence of pregnant women aged 15–44 years in each alcohol consumption category was used to calculate the AAFs by ethnicity with equation 1 (k = 3).

Ischaemic heart disease: AAFs were calculated using equation 1 (with k = 6). In contrast to the three sex-specific average alcohol consumption categories used for the conditions listed above, the four ischaemic heart disease average alcohol consumption categories were identical for men and women. Drinking pattern was also factored into the ischaemic heart disease equation, with an additional category and RR estimate for ‘people with irregular HDOs’. See Appendix E and the ‘Relative risk estimates (mortality): Ischaemic heart disease’ section starting on page 140 for more information about RR and prevalence estimates for the ischaemic heart disease alcohol consumption categories.

Unipolar depressive disorders: AAFs were not estimated with equation 1. The relationship between unipolar depressive disorders and alcohol consumption is complicated by a potentially bidirectional causal pathway (i.e. depression can cause self-medication with alcohol and/or alcohol use can cause depression) and genetic and environmental confounding factors that impact both depression and alcohol consumption.[2,17] During the first stage of updating the estimates for the alcohol-attributable burden of mortality and morbidity for the GBD 2005/2010 study, Rehm *et al.* agreed that sufficient evidence exists that some of the unipolar depression is caused by alcohol consumption.[2] Despite this general agreement, the GBD 2005/2010 study did not include unipolar depressive disorders as an alcohol-attributable condition category due to the lack of available data for estimating RRs or AAFs.[2,6]

A previous approach proposed by Rehm *et al.* estimated AAFs of depressive disorders directly from the prevalence of alcohol dependence in people aged ≥15 years in different subregions of the world.[17] This analysis resulted in Wpr-A subregion AAFs for major depression of 3.84% for males and 1.31% for females. In the absence of more accurate New Zealand-based AAF estimates, we applied these Wpr-A AAFs to the 2004 and 2007 New Zealand mortality data. These calculations showed that no unipolar depressive disorder deaths were attributable to alcohol in New Zealand, so we chose to omit depression from the mortality analysis.

Relative risk estimates (mortality)

Table 13 shows the male and female relative risk values used in the mortality AAF calculations for each partially alcohol-related condition, with lifetime abstainers as the reference group. These sex-specific relative risk values for ex-drinkers and three levels of average daily alcohol consumption were supplied by the Global Burden of Disease 2010 Risk Factors Collaborating Group.

As described in detail by Rehm *et al.*,[2] these RRs were based on the best available estimates of each alcohol-condition causal association, and were mainly derived from systematic literature reviews of the most recent meta-analysis data available. The categorical relative risk estimates provided to us by the GBD 2010 Risk Factors Collaborating Group were calculated based on the midpoint of each alcohol consumption category using the continuous function of the respective meta-analyses cited in Rehm *et al.*[2] RRs for the open-ended consumption categories (i.e. 40+ and 60+ grams of alcohol per day) were calculated by using the cut-off number plus 1.5 times the width of the previous consumption category. For example, the RR for men who consumed 60+ grams of alcohol per day was estimated using the value of 90g = [60g + 1.5 * (59.99g – 40g)].

Table 13: Mortality relative risks for partially alcohol-attributable (non-injury) conditions, excluding ischaemic heart disease.

	Average daily alcohol consumption*							
	Males				Females			
	Ex†	I	II	III	Ex†	I	II	III
Cancers								
Mouth and	1.21	1.66	3.11	4.70	1.44	1.30	2.08	3.40
Oesophagus cancer	1.21	1.30	1.93	2.65	1.44	1.14	1.48	2.05
Colon cancer	1.21	1.04	1.10	1.15	1.44	1.02	1.06	1.11
Rectum cancer	1.21	1.07	1.19	1.30	1.44	1.04	1.11	1.21
Liver cancer	1.21	1.15	1.40	1.61	1.44	1.08	1.23	1.44
Laryngeal cancer	1.21	1.33	2.02	2.82	1.44	1.15	1.53	2.16
Female breast cancer	NA	NA	NA	NA	1.44	1.09	1.30	1.62
Neuro-psychiatric disorders								
Epilepsy	1	1.29	1.86	2.53	1.44	1.14	1.45	1.98
Cardiovascular disorders								
Hypertensive heart	1	1.20	1.57	1.97	1.00	0.89	1.61	3.16
Cardiac arrhythmias	1	1.12	1.33	1.54	1.44	1.06	1.19	1.37
Ischaemic stroke	1	0.91	1.10	1.29	1.15	0.66	0.78	1.22
Haemorrhagic stroke	1	1.15	1.41	1.68	1.15	1.16	1.55	2.24
Digestive disorders								
Oesophageal varices	1	1.76	4.06	8.17	6.50	2.82	5.97	11.20
Cholelithiasis	1.00	0.82	0.68	0.50	1.00	0.82	0.68	0.50
Pancreatitis	1.21	1.06	1.46	2.34	1.44	1.02	1.15	1.58
Conditions arising during pregnancy								
Low birth weight	NA	NA	NA	NA	1.00	1.00	1.35	2.11
Respiratory disorders								
Tuberculosis	1.21	1.00	2.96	2.96	1.44	1.00	1.00	2.96
Lower respiratory infections: pneumonia	1.21	1.10	1.27	1.43	1.44	1.05	1.15	1.30
Diabetes mellitus	1.18	0.87	0.95	1.11	1.14	0.68	0.62	1.41

* Alcohol consumption categories measured in average grams of pure alcohol consumed per day.
Males: Ex: 0 g (ex-drinkers), I: 0.01−39.99 g, II: 40−59.99 g, and III: 60+ g.
Females: Ex: 0 g (ex-drinkers), I: 0.01−19.99 g, II: 20−39.99 g, and III: 40+ g.

† In keeping with the GBD 2005/2010 study methods,[2] all-cause mortality relative risks for ex-drinkers were used for selected conditions where separate RRs were not computed (i.e. all cancers, epilepsy, cardiac arrhythmias, pancreatitis, tuberculosis, and lower respiratory infections: pneumonia).

NA = Not applicable.

Each relative risk represents the ratio of the probability of an exposed person (i.e. drinker or ex-drinker) dying from the condition compared to an unexposed person (i.e. lifetime abstainer), when all other factors are equal. A relative risk of 1.00 means there is no difference in mortality risk between people in a specific alcohol consumption category and abstainers, while relative risk values greater than 1.00 mean that drinkers/ex-drinkers have an increased risk of mortality compared to abstainers, and relative risk values less than 1.00 indicate that drinkers/ex-drinkers have a reduced risk of mortality compared to abstainers. For example, Table 13 shows that female drinkers with daily average consumptions of less than 20 grams of alcohol (consumption category I) are 1.3 times more likely to die from mouth/oropharyngeal cancer than female abstainers, while female drinkers who consume an average of 40 or more grams of alcohol per day (consumption category III) are 3.4 times more likely to die from mouth/oropharyngeal cancer than female abstainers. Conversely, for cholelithiasis (gallstones), females who drink 40+ grams of alcohol per day have a relative risk of 0.50, which means that the heaviest female drinkers are half as likely to die from cholelithiasis than female abstainers.

As shown by equation 1, the impact of RR values on the AAF estimates for the age/sex/ethnicity subgroups depends largely on the corresponding alcohol consumption category prevalences for each subgroup. Large RRs for a given alcohol-condition relationship do not automatically result in large AAFs, since very few deaths would be attributable to alcohol consumption if only a small proportion of a given subgroup consumes alcohol at the level(s) for which the large RRs are applied. On the other hand, if a large proportion of the subgroup consumes alcohol, even small RRs could result in large AAFs.

Detrimental impact

For most alcohol-related conditions in both men and women, current and past alcohol consumption has a detrimental impact on mortality compared to abstention. The magnitude of this negative impact usually increases with the average daily volume of alcohol consumed, as shown in Table 13 by RR values that increase with each level of alcohol consumption.

Beneficial impact

Cholelithiasis is the only condition for which all levels of current alcohol consumption have consistently been found to confer protection compared to abstention, with 18−50% relative reductions in risk of mortality due to cholelithiasis for both men and women.

Detrimental or beneficial impact

Diabetes mellitus: Compared to abstainers, men and women with the highest levels of average daily alcohol consumption have an increased risk of death due to diabetes mellitus. Women who consume more than 40 grams of alcohol per day are 1.41 times more likely to die from diabetes mellitus compared to female abstainers, while men who drink more than 60 grams of alcohol per day are 1.11 times more likely to die from diabetes mellitus compared to male abstainers. Male and female ex-drinkers also have an increased risk compared to lifetime abstainers. However, alcohol consumption has a protective effect on diabetes mortality for all low- and medium-volume drinkers. The strength of this beneficial association is largest in female drinkers, with reductions in mortality risk of

approximately one-third compared to female abstainers. The benefits experienced by male drinkers compared to male abstainers are small (5–13%).

Hypertensive heart disease: As average daily alcohol consumption levels increase, so does the risk of mortality from hypertensive heart disease in both men and women. The relative risks from this strong association show that the heaviest male drinkers (60+ grams of alcohol per day) are twice as likely to die from hypertensive heart disease compared to male abstainers, while the heaviest female drinkers (40+ grams of alcohol per day) have more than a threefold increase in mortality risk compared to female abstainers. The only exception to this pattern is a small reduction in risk (11%) found in women who drink less than 20 grams of alcohol per day compared to abstainers.

Ischaemic stroke: Men and women with the highest levels of average daily alcohol consumption and male and female ex-drinkers all experience increased risks of ischaemic stroke mortality compared to abstainers. Males in consumption category II (40–59.99 grams of alcohol per day) also have a slightly higher risk of death than abstainers, while men in consumption category I (0.01–39.99 grams of alcohol per day) have a small reduction in risk (9%) of ischaemic stroke mortality compared to abstainers. A protective effect is also found in the lowest and middle categories of female drinkers, with 34% and 22% reductions in risk of dying from ischaemic stroke compared to female abstainers, respectively.

Ischaemic heart disease: Table 14 shows the sex-specific relative risk values for ischaemic heart disease mortality by average daily alcohol consumption, with lifetime abstainers as the reference group. Drinking pattern was also accounted for when calculating the impact of alcohol on ischaemic heart disease: a proportion of people with irregular heavy drinking occasions (people who consumed over 60 grams of alcohol per drinking occasion *at least monthly, but not daily*) were assigned relative risks of 1.00, since irregular heavy drinking occasions eliminate the beneficial impact of regular alcohol consumption. For calculation details, please see the ‘Methodological developments: Ischaemic heart disease’ section starting on page 68 and Appendix E.

As shown in Table 14, alcohol consumption has a detrimental impact on the risk of ischaemic heart disease mortality for all former drinkers, with male and female ex-drinkers 1.21 and 1.39 times more likely to die from ischaemic heart disease compared to male and female lifetime abstainers, respectively. Women with regular heavy drinking occasions (average 60+ grams of alcohol per day) are also at increased risk, as they are twice as likely to die from ischaemic heart disease compared to female lifetime abstainers.

On the other hand, regular alcohol consumption has been associated with a reduced risk of ischaemic heart disease mortality for all male drinkers, with mortality risk reductions of 12−23% compared to male lifetime abstainers. Female drinkers who consume less than 60 grams of alcohol per day also show a beneficial association between alcohol consumption and reduced ischaemic heart disease mortality, with mortality risk reductions of 10−34% compared to female lifetime abstainers.

Table 14: Mortality relative risks for ischaemic heart disease.[*]

Average daily alcohol consumption	Males	Females
Abstainers	1.00	1.00
Ex-drinkers[†]	1.21	1.39
0.01–19.99 g/day	0.86	0.88
20–39.99 g/day	0.79	0.66
40–59.99 g/day	0.88	0.90
60+ g/day	0.77	2.08

[*] RRs provided by Roerecke and Rehm.[37] In addition to these RRs, people with irregular heavy drinking occasions were assigned RRs of 1.00 (see 0 for details). RR calculations used all available data points from meta-analysis studies that reported estimates stratified by sex and endpoint (mortality vs. morbidity). If multiple estimates per study were reported within any alcohol consumption category, those estimates were pre-pooled using fixed effect models. RRs based on current abstainer rather than long-term abstainer were adjusted to include the effect of ex-drinker for mortality estimates. The results presented are from random effect models.
[†] RRs for ex-drinkers are from a separate analysis.[2]

AAFs for partially alcohol-attributable injuries

Derivation of AAFs for injuries required a different approach than for conditions, as injury risk is impacted by drinking pattern as well as average daily alcohol consumption.

Injury AAFs for adults (15–79 years old)

We planned to estimate new injury AAFs using the most recent Global Burden of Disease (GBD) modelling methods to incorporate New Zealand data on average alcohol consumption and detailed drinking patterns for each age/sex/ethnicity-specific subgroup. However, the GBD methodology, which has been optimised for the scale of World Health Organization sub-regions, did not perform well with our country-level New Zealand data. In particular, the model did not appear robust to the extreme drinking patterns in the younger New Zealand age categories. A limitation of using a single approach for calculating injury AAFs for different countries is that injury AAFs are not only influenced by alcohol consumption volumes and patterns, but also by the context in which drinking takes place. For example, the proportion of alcohol-attributable motor vehicle accidents amongst young people depends not only on drinking patterns, but also on the factors that lead to driving while drinking. Such complex context-dependent factors vary from country to country and are difficult to quantify. Due to the lack of external validity of the modelled AAFs for some groups, we decided to use locally derived AAFs as for the previous report.

A literature search for recent New Zealand-based estimates of alcohol-related injury risk did not yield new data from which to update the injury AAFs used in the previous NZBoA2000/02 report. The

alcohol-attributable road traffic injury (RTI) death estimates calculated with NZBoA2000/02 injury AAFs were largely consistent with the numbers of alcohol-attributable RTI deaths derived directly from routine 2003–2007 New Zealand data.[42] In contrast, the use of GBD injury AAFs resulted in higher numbers of alcohol-attributable RTI deaths and implausibly high AAFs for the younger age categories that differed markedly from the age-specific AAFs calculated directly from New Zealand data.

Taking these issues into consideration, we used the NZBoA2000/02 age/sex/ethnicity-specific injury AAF estimates[1] for our main injury burden analyses, as they are the most reliable New Zealand injury AAFs currently available. As in the NZBoA2000/02 report, we used a 1.5 multiplier to account for the impact of ethnicity-specific drinking patterns on specific injury AAFs, a decision that was further supported by the magnitude of ethnic differences present in the drinking pattern-dependent injury AAFs calculated by the GBD 2010 Risk Factors Collaborating Group. Our injury burden analysis must therefore be taken as conservative, since it only reflects changes in the absolute numbers of injuries since 2000 and not changes in alcohol consumption volumes or patterns, or secular trends such as the reductions in road traffic injury generally. However, we considered this a better option than having most of the change in injury burden being the result of a different methodology that produces results that are incongruent with local data.

A detailed description of how the injury AAFs were derived can be found in the NZBoA2000/02 report.[1] In the interest of completeness, we also performed a sensitivity analysis using the injury AAFs calculated by the GBD 2010 Risk Factors Collaborating Group (see Appendix C for injury sensitivity analysis methods and results).

Injury AAFs for children (under 15 years old)

Similar to the previous NZBoA2000/02 report, the analysis of injury outcomes in people under 15 years of age was restricted to the secondary effects of drinking by another person. The consequences of drinking in under 15 year olds were excluded since very few reliable epidemiological studies have been conducted about the prevalence or risk of alcohol consumption in this age category.

Road traffic injuries and fires

Given the lack of reliable estimates of injury relative risks for children, AAFs for child deaths due to road traffic injuries and fires (attributable to another person's alcohol use) were calculated directly using the best available New Zealand data.

For children under 15 years old, AAFs were estimated directly from New Zealand statistics that showed that 20% of road traffic deaths were related to alcohol between 2003 and 2007 (data from the New Zealand Crash Analysis System of Land Transport (now the NZ Transport Agency); adjusted for under-reporting and under-measurement of alcohol).[42] Since ethnicity information was not available for these data, the 20% AAF was used for both Māori and non-Māori children.

For residential house fires causing death of children under 15 years old, data from 1997–2003 indicate that 24% of these deaths were secondary to alcohol use (BAC >0.08) by the person responsible.[43] Although ethnicity information was available for these data, accurate calculation of separate AAFs for Māori and non-Māori children was not possible due to the small sample size (n = 10). The 24% AAF was therefore used for both Māori and non-Māori children.

Other unintentional injuries and assault

Updated AAF estimates were not available for the 'other unintentional injuries' or 'assault' categories, so we used the same AAFs as the NZBoA2000/02 report for 0–14 year old males and females.[1]

Mortality AAF estimates

Although we have presented our AAF estimates as point estimates in this report, it is important to understand that each of these estimates has an unquantified degree of uncertainty. As previously discussed, AAFs are calculated with formulae that use the best estimates currently available for relative risks and population alcohol consumption measures. Therefore, the accuracy of each AAF estimate presented in this report depends on the availability and quality of both the relative risks and alcohol consumption estimates used for its calculation. This is an unavoidable methodological limitation common to all AAF estimates that has been discussed by the GBD 2010 Risk Factors Collaborating Group.[2]

Alcohol-attributable condition AAFs

The 2004 and 2007 mortality alcohol-attributable fraction (AAF) estimates for conditions are shown for each age/sex subgroup of Māori and non-Māori New Zealanders in Tables 15–18.

Alcohol-attributable injury AAFs

The mortality alcohol-attributable fraction (AAF) estimates for injuries are shown for each age/sex subgroup of Māori and non-Māori New Zealanders in Tables 19–20.

Table 15: 2004 mortality AAFs for (non-injury) conditions: Māori population.[*]

	Māori males							Māori females						
	0–4	5–14	15–29	30–44	45–59	60–69	70–79	0–4	5–14	15–29	30–44	45–59	60–69	70–79
Mouth and oropharynx cancers			59.0%	49.3%	44.6%	45.6%	43.5%			43.2%	33.2%	31.6%	27.8%	24.7%
Oesophagus cancer			39.4%	31.1%	27.8%	28.7%	27.1%			26.4%	21.2%	20.4%	20.0%	20.5%
Colon cancer			7.0%	6.8%	7.4%	7.7%	7.5%			6.6%	9.2%	9.5%	13.1%	16.9%
Rectum cancer			12.0%	10.4%	10.3%	10.7%	10.3%			9.5%	10.8%	11.0%	14.1%	17.4%
Liver cancer			21.4%	17.6%	16.5%	17.0%	16.3%			15.4%	14.5%	14.3%	16.3%	18.6%
Laryngeal cancer			41.6%	33.0%	29.5%	30.4%	28.7%			28.1%	22.2%	21.3%	20.7%	20.8%
Female breast cancer										18.9%	16.4%	16.1%	17.3%	19.1%
Alcohol use disorders	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Epilepsy			37.8%	29.8%	26.7%	27.6%	26.1%			25.4%	20.6%	19.8%	19.7%	20.4%
Hypertensive heart disease			28.2%	21.1%	18.0%	18.5%	17.3%			28.7%	10.9%	9.7%	0.9%	-5.2%
Ischaemic heart disease			-14.8%	-11.1%	-7.8%	-8.0%	-7.9%			5.5%	1.5%	2.1%	4.0%	10.9%
Cardiac arrhythmias			19.0%	15.4%	14.5%	15.0%	14.3%			13.5%	13.2%	13.1%	15.4%	18.1%
Ischaemic stroke			4.2%	1.2%	2.5%	3.0%	2.2%			-19.2%	-21.7%	-18.9%	-15.6%	-9.2%
Haemorrhagic stroke			22.7%	18.9%	18.1%	18.8%	18.0%			28.0%	19.6%	18.4%	15.0%	12.0%
Oesophageal varices			70.7%	59.3%	53.6%	55.2%	52.2%			79.4%	75.6%	74.9%	75.3%	76.5%
Alcoholic liver cirrhosis	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Cholelithiasis			-32.3%	-23.6%	-19.6%	-20.3%	-19.3%			-29.3%	-19.6%	-17.5%	-13.2%	-8.7%
Pancreatitis			28.9%	18.7%	15.8%	17.0%	15.2%			14.1%	12.0%	12.1%	13.9%	16.8%
Low birth weight	7.3%							7.3%						
Fetal alcohol syndrome	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tuberculosis			40.0%	26.0%	21.1%	21.0%	17.1%			27.5%	16.8%	17.0%	14.0%	16.3%
Lower respiratory infections: pneumonia			16.0%	13.2%	12.7%	13.1%	12.6%			11.7%	12.2%	12.2%	14.8%	17.8%
Diabetes mellitus			-3.7%	-5.8%	-4.4%	-4.1%	-4.6%			-16.5%	-20.8%	-17.6%	-16.0%	-8.9%

[*] These AAFs were used for calculating 2004 alcohol-attributable deaths and YLLs. AAF estimates for 60+ years have more uncertainty due to smaller sample sizes and the use of extrapolated alcohol consumption estimates.

Table 16: 2004 mortality AAFs for (non-injury) conditions: Non-Māori population.*

	Non-Māori males							Non-Māori females						
	0–4	**5–14**	**15–29**	**30–44**	**45–59**	**60–69**	**70–79**	**0–4**	**5–14**	**15–29**	**30–44**	**45–59**	**60–69**	**70–79**
Mouth and oropharynx cancers			56.7%	47.7%	47.5%	45.8%	43.8%			35.3%	31.5%	31.0%	28.2%	25.5%
Oesophagus cancer			37.2%	29.4%	29.4%	28.1%	26.7%			20.5%	18.2%	17.9%	17.2%	15.8%
Colon cancer			6.3%	5.4%	5.8%	5.8%	5.7%			4.7%	4.6%	4.6%	6.5%	6.7%
Rectum cancer			11.1%	9.1%	9.4%	9.1%	8.8%			6.9%	6.6%	6.5%	8.0%	7.9%
Liver cancer			20.1%	16.4%	16.5%	16.0%	15.3%			11.8%	10.9%	10.7%	11.4%	10.9%
Laryngeal cancer			39.3%	31.3%	31.2%	29.9%	28.3%			21.8%	19.4%	19.1%	18.1%	16.6%
Female breast cancer										14.4%	13.0%	12.8%	13.0%	12.2%
Alcohol use disorders	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Epilepsy			35.6%	28.2%	28.2%	27.0%	25.6%			19.7%	17.6%	17.3%	16.7%	15.4%
Hypertensive heart disease			26.5%	20.5%	20.2%	19.2%	18.0%			15.8%	7.7%	7.4%	3.0%	0.7%
Ischaemic heart disease			-16.7%	-15.3%	-13.7%	-13.1%	-12.1%			-5.6%	-8.3%	-9.5%	-5.7%	-4.1%
Cardiac arrhythmias			17.6%	14.1%	14.3%	13.8%	13.2%			10.1%	9.3%	9.2%	10.1%	9.8%
Ischaemic stroke			2.0%	-3.0%	-1.6%	-1.9%	-1.9%			-27.4%	-32.7%	-31.9%	-27.8%	-24.5%
Haemorrhagic stroke			21.1%	17.0%	17.3%	16.8%	16.1%			21.8%	19.0%	18.7%	16.4%	14.5%
Oesophageal varices			68.2%	56.3%	56.5%	54.1%	51.5%			74.2%	72.0%	71.6%	71.1%	69.3%
Alcoholic liver cirrhosis	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Cholelithiasis			-30.3%	-24.0%	-23.3%	-22.1%	-20.6%			-24.1%	-22.6%	-22.0%	-18.5%	-15.9%
Pancreatitis			25.9%	15.3%	15.9%	14.4%	13.0%			8.9%	7.1%	6.9%	7.9%	7.6%
Low birth weight	3.7%							3.7%						
Fetal alcohol syndrome	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tuberculosis			36.1%	22.5%	22.2%	20.0%	17.7%			15.4%	10.0%	8.9%	8.9%	7.9%
Lower respiratory infections: pneumonia			14.8%	11.9%	12.1%	11.8%	11.3%			8.7%	8.1%	8.0%	9.2%	9.0%
Diabetes mellitus			-5.3%	-9.1%	-7.9%	-8.0%	-7.8%			-26.8%	-32.5%	-32.4%	-27.8%	-24.4%

* These AAFs were used for calculating 2004 alcohol-attributable deaths and YLLs. AAF estimates for 60+ years have more uncertainty due to smaller sample sizes and the use of extrapolated alcohol consumption estimates.

Table 17: 2007 mortality AAFs for (non-injury) conditions: Māori population.[*]

	Māori males							Māori females						
	0–4	5–14	15–29	30–44	45–59	60–69	70–79	0–4	5–14	15–29	30–44	45–59	60–69	70–79
Mouth and oropharynx cancers			59.7%	55.6%	49.4%	45.6%	43.5%			46.1%	36.4%	32.8%	27.8%	24.7%
Oesophagus cancer			40.2%	36.4%	32.0%	28.7%	27.1%			29.0%	22.5%	21.5%	20.0%	20.5%
Colon cancer			7.5%	7.3%	9.3%	7.7%	7.5%			8.2%	8.0%	10.4%	13.1%	16.9%
Rectum cancer			12.6%	11.8%	12.5%	10.7%	10.3%			11.2%	10.0%	11.9%	14.1%	17.4%
Liver cancer			22.2%	20.3%	19.1%	17.0%	16.3%			17.4%	14.5%	15.3%	16.3%	18.6%
Laryngeal cancer			42.4%	38.5%	33.8%	30.4%	28.7%			30.7%	23.8%	22.5%	20.7%	20.8%
Female breast cancer										21.1%	16.9%	17.1%	17.3%	19.1%
Alcohol use disorders	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Epilepsy			38.6%	34.9%	30.8%	27.6%	26.1%			27.9%	21.8%	21.0%	19.7%	20.4%
Hypertensive heart disease			28.8%	25.5%	20.5%	18.5%	17.3%			32.3%	15.0%	8.3%	0.9%	-5.2%
Ischaemic heart disease			-16.0%	-13.7%	-5.7%	-8.1%	-8.0%			9.2%	1.2%	5.1%	4.0%	10.9%
Cardiac arrhythmias			19.7%	17.9%	17.2%	15.0%	14.3%			15.5%	13.0%	14.1%	15.4%	18.1%
Ischaemic stroke			3.9%	2.7%	7.4%	3.0%	2.2%			-17.2%	-25.7%	-22.8%	-15.6%	-9.2%
Haemorrhagic stroke			23.5%	21.6%	21.5%	18.8%	18.0%			30.3%	22.2%	19.2%	15.0%	12.0%
Oesophageal varices			71.2%	66.5%	60.4%	55.2%	52.2%			81.4%	76.8%	76.3%	75.3%	76.5%
Alcoholic liver cirrhosis	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Cholelithiasis			-34.5%	-29.5%	-21.3%	-20.3%	-19.3%			-32.1%	-24.0%	-19.5%	-13.2%	-8.7%
Pancreatitis			29.2%	24.5%	21.7%	17.0%	15.2%			16.6%	11.9%	12.9%	13.9%	16.8%
Low birth weight	7.3%							7.3%						
Fetal alcohol syndrome	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tuberculosis			39.5%	34.8%	29.0%	21.0%	17.1%			31.9%	18.8%	18.4%	14.0%	16.3%
Lower respiratory infections: pneumonia			16.6%	15.3%	15.1%	13.1%	12.6%			13.6%	11.7%	13.2%	14.8%	17.8%
Diabetes mellitus			-4.5%	-5.3%	-0.8%	-4.1%	-4.6%			-13.5%	-24.2%	-20.5%	-16.0%	-8.9%

[*] These AAFs were used for calculating 2007 alcohol-attributable deaths and YLLs. AAF estimates for 60+ years have more uncertainty due to smaller sample sizes and the use of extrapolated alcohol consumption estimates.

Table 18: 2007 mortality AAFs for (non-injury) conditions: Non-Māori population.*

	Non-Māori males							Non-Māori females						
	0–4	5–14	15–29	30–44	45–59	60–69	70–79	0–4	5–14	15–29	30–44	45–59	60–69	70–79
Mouth and oropharynx cancers			53.3%	50.5%	46.2%	45.8%	43.8%			35.7%	31.7%	32.2%	28.2%	25.5%
Oesophagus cancer			34.3%	31.9%	28.5%	28.1%	26.7%			21.5%	19.2%	19.4%	17.2%	15.8%
Colon cancer			6.6%	6.2%	5.9%	5.8%	5.7%			6.5%	6.5%	6.4%	6.5%	6.7%
Rectum cancer			10.7%	10.1%	9.3%	9.1%	8.8%			8.6%	8.3%	8.3%	8.0%	7.9%
Liver cancer			18.8%	17.8%	16.2%	16.0%	15.3%			13.2%	12.3%	12.4%	11.4%	10.9%
Laryngeal cancer			36.3%	33.8%	30.3%	29.9%	28.3%			22.8%	20.3%	20.6%	18.1%	16.6%
Female breast cancer										15.6%	14.2%	14.4%	13.0%	12.2%
Alcohol use disorders	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Epilepsy			32.8%	30.6%	27.4%	27.0%	25.6%			20.7%	18.6%	18.9%	16.7%	15.4%
Hypertensive heart disease			23.8%	22.1%	19.4%	19.2%	18.0%			15.9%	7.5%	8.1%	3.0%	0.7%
Ischaemic heart disease			-14.6%	-14.2%	-13.5%	-13.1%	-12.0%			0.7%	-3.9%	-6.0%	-5.6%	-4.1%
Cardiac arrhythmias			16.5%	15.5%	14.0%	13.8%	13.2%			11.6%	10.8%	10.9%	10.1%	9.8%
Ischaemic stroke			1.6%	-0.6%	-1.9%	-1.9%	-1.9%			-24.7%	-29.6%	-30.2%	-27.8%	-24.5%
Haemorrhagic stroke			20.0%	18.7%	17.1%	16.8%	16.1%			21.9%	18.9%	19.3%	16.4%	14.5%
Oesophageal varices			64.5%	60.1%	54.8%	54.1%	51.5%			75.5%	73.5%	73.8%	71.1%	69.3%
Alcoholic liver cirrhosis	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Cholelithiasis			-27.1%	-25.8%	-22.9%	-22.1%	-20.6%			-23.4%	-21.6%	-22.2%	-18.5%	-15.9%
Pancreatitis			22.8%	18.5%	14.9%	14.4%	13.0%			10.8%	8.9%	8.9%	7.9%	7.6%
Low birth weight	3.7%							3.7%						
Fetal alcohol syndrome	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tuberculosis			29.9%	27.6%	19.4%	20.0%	17.7%			19.1%	12.6%	12.2%	8.9%	7.9%
Lower respiratory infections: pneumonia			14.0%	13.1%	12.0%	11.8%	11.3%			10.3%	9.7%	9.8%	9.2%	9.0%
Diabetes mellitus			-5.5%	-7.6%	-8.2%	-8.0%	-7.8%			-22.4%	-28.7%	-29.8%	-27.8%	-24.4%

* These AAFs were used for calculating 2007 alcohol-attributable deaths and YLLs. AAF estimates for 60+ years have more uncertainty due to smaller sample sizes and the use of extrapolated alcohol consumption estimate

Table 19: 2004 and 2007 mortality AAFs for injuries: Māori population.[*]

	Māori males							Māori females						
	0–4	5–14	15–29	30–44	45–59	60–69	70–79	0–4	5–14	15–29	30–44	45–59	60–69	70–79
Road traffic injuries	20.0%	20.0%	60.4%	58.7%	20.6%	13.7%	13.7%	20.0%	20.0%	36.8%	34.6%	10.8%	3.1%	3.1%
Alcohol poisonings	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Non-alcohol poisonings			51.9%	28.6%	28.6%	28.6%	14.3%			39.9%	26.0%	26.0%	26.0%	12.1%
Falls			39.4%	39.4%	39.4%	30.4%	21.5%			24.3%	24.3%	24.3%	15.6%	6.9%
Fires	24.0%	24.0%	51.9%	51.9%	43.0%	43.0%	43.0%	24.0%	24.0%	39.9%	39.9%	32.9%	32.9%	32.9%
Drownings			46.5%	55.5%	55.5%	44.8%	44.8%			43.3%	52.0%	52.0%	41.6%	41.6%
Other unintentional injuries	28.6%	28.6%	51.9%	51.9%	43.0%	43.0%	43.0%	8.7%	8.7%	39.9%	39.9%	32.9%	32.9%	32.9%
Self-inflicted injuries			17.9%	17.9%	13.1%	13.1%	6.0%			11.6%	11.6%	9.2%	9.2%	5.8%
Assault	25.1%	25.1%	48.3%	48.3%	48.3%	48.3%	48.3%	24.3%	24.3%	46.8%	46.8%	46.8%	46.8%	46.8%
Other intentional injuries			23.9%	23.9%	23.9%	23.9%	11.9%			23.1%	23.1%	23.1%	23.1%	11.6%

[*] These AAFs were used for calculating 2004 and 2007 alcohol-attributable deaths and YLLs.

Table 20: 2004 and 2007 mortality AAFs for injuries: Non-Māori population.*

	Non-Māori males							Non-Māori females						
	0–4	5–14	15–29	30–44	45–59	60–69	70–79	0–4	5–14	15–29	30–44	45–59	60–69	70–79
Road traffic injuries	20.0%	20.0%	40.3%	39.1%	13.8%	9.1%	9.1%	20.0%	20.0%	24.6%	23.1%	7.2%	2.1%	2.1%
Alcohol poisonings	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Non-alcohol poisonings			34.6%	19.1%	19.1%	19.1%	9.5%			26.6%	17.3%	17.3%	17.3%	8.1%
Falls			26.3%	26.3%	26.3%	20.3%	14.3%			16.2%	16.2%	16.2%	10.4%	4.6%
Fires	24.0%	24.0%	34.6%	34.6%	28.6%	28.6%	28.6%	24.0%	24.0%	26.6%	26.6%	21.9%	21.9%	21.9%
Drownings			31.0%	37.0%	37.0%	29.8%	29.8%			28.9%	34.7%	34.7%	27.7%	27.7%
Other unintentional injuries	19.1%	19.1%	34.6%	34.6%	28.6%	28.6%	28.6%	5.8%	5.8%	26.6%	26.6%	21.9%	21.9%	21.9%
Self-inflicted injuries			17.9%	17.9%	13.1%	13.1%	6.0%			11.6%	11.6%	9.2%	9.2%	5.8%
Assault	16.7%	16.7%	32.2%	32.2%	32.2%	32.2%	32.2%	16.2%	16.2%	31.2%	31.2%	31.2%	31.2%	31.2%
Other intentional injuries			23.9%	23.9%	23.9%	23.9%	11.9%			23.1%	23.1%	23.1%	23.1%	11.6%

* These AAFs were used for calculating 2004 and 2007 alcohol-attributable deaths and YLLs.

CALCULATING ALCOHOL-ATTRIBUTABLE DEATHS AND YEARS OF LIFE LOST (YLLS)

Alcohol-attributable deaths

To determine the number of deaths that were attributable to alcohol in New Zealand during 2004 and 2007, the mortality AAFs for each alcohol-related condition (2004: Tables 15 and 16; 2007: Tables 17 and 18) and injury (2004 and 2007: Tables 19 and 20) were multiplied by the total number of corresponding cause-specific annual deaths in each age/sex/ethnicity subgroup. Alcohol-attributable deaths due to low birth weight were calculated by applying the ethnicity-specific low birth weight mortality AAFs to non-Māori and Māori deaths due to low birth weight (i.e. 0–4 years age category).

The absolute numbers of alcohol-attributable deaths in New Zealand are an important population health indicator. However, other measures can incorporate additional information. Years of life lost (YLLs) account for the fact that alcohol-attributable deaths due to some causes occur mainly in young people (e.g. most injuries), while other causes mainly reduce the life expectancy of older people (e.g. most cancers).[44]

Alcohol-attributable years of life lost (YLLs)

Alcohol-attributable YLLs are the years of life lost due to premature mortality caused by alcohol consumption. We derived cause-specific YLLs from the New Zealand mortality data by multiplying the number of alcohol-attributable deaths in each age/sex/ethnicity subgroup by the extra years of life individuals in that age subgroup would have been expected to live if they had not consumed alcohol.

Our calculations used the 'remaining life expectancy method' outlined by Mathers *et al.*, based on Coale and Demeny West Level 26 and 25 model life tables with life expectancies at birth of 82.5 years for women and 80 for men.[45] The method was applied to life expectancy calculations for both Māori and non-Māori. Equation 2 shows the general approach used to calculate YLLs using life table methods. For each age/sex subgroup and cause of death:

$$Years\ of\ life\ lost\ (YLL) = N \times L, \tag{2}$$

where N is the number of alcohol-attributable deaths due to a given cause and L is the life expectancy for the corresponding age/sex category.[46] Our YLL calculations also used 3% time-discounting and age-weighting, methodologies that are consistent with recent Global Burden of Disease study publications,[47,48] other national-level burden of disease analyses,[19,49] and the previous NZBoA2000/02 report.[1]

METHODS: ALCOHOL-ATTRIBUTABLE DALYS (2004)

SUMMARY

The previous methods section of this report calculated the numbers of deaths that were attributable to alcohol in New Zealand during 2004 and 2007. The quantification of non-fatal alcohol-attributable disability is an equally important component of our analysis, since some alcohol-related conditions and injuries have long-term non-fatal consequences that are not captured by mortality estimates. Several country-level and global burden of disease analyses have highlighted this as a particularly important issue for neuro-psychiatric disorders since conditions such as alcohol use disorders and unipolar depressive disorders have substantial impacts on population health despite their negligible impacts on mortality.[2,19,47,49,50]

This section estimates the alcohol-attributable burden of disease and injury in New Zealand during 2004 only, because 2004 was the most recent year for which the estimates required for burden calculations were available from the WHO Global Burden of Disease study. As described in detail in the following section, we calculated the fatal and non-fatal health impacts of alcohol consumption for each condition and injury, and then combined these impacts into a single summary measure.

As shown below, the alcohol-attributable burden of disease and injury in New Zealand was estimated by age/sex subgroups but not by Māori and non-Māori ethnicity. This simplification was necessary because the World Health Organization (WHO) 2004 Global Burden of Disease estimates that were used as part of these analyses were not available for Māori and non-Māori separately.[1]

DISABILITY-ADJUSTED LIFE YEARS (DALYS)

The burden of disease and injury attributable to alcohol is quantified by using the disability-adjusted life year (DALY), a standardised population health summary measure that combines morbidity and mortality by estimating lost years of healthy life due to dying prematurely or to living with the negative health consequences of alcohol.[48] The DALY is the primary metric used by the WHO Global Burden of Disease studies to assess and rank the burden of a wide variety of fatal and non-fatal population health risk factors and outcomes.[6] The WHO describes DALYs as “a measurement of the gap between current health status and an ideal situation where everyone lives into old age, free of disease and disability”, with zero alcohol use considered the ideal situation when calculating alcohol-attributable DALYs.[48]

DALYs are calculated for each condition and injury by summing the alcohol-attributable years of life lost due to premature death (YLLs) and the alcohol-attributable years of ‘healthy’ life lost due to living in a state of poor health or disability (YLDs) as shown in equation 3 below:

$$DALY = YLL + YLD \quad (3)$$

For more details about our DALY data sources and calculations, please refer to the following sections: 'Burden of disease and injury data' (page 54) and 'Calculating alcohol-attributable disability-adjusted life years (DALYs)' (page 61).

DIFFERENCES IN ALCOHOL-ATTRIBUTABLE CONDITION AND INJURY CATEGORIES BETWEEN MORTALITY AND DALY ANALYSES

Since our 2004 New Zealand alcohol-attributable burden of disease and injury calculations included data received from the WHO Global Burden of Disease (GBD) study, only GBD categories of conditions and injuries could be used for DALY calculations. This resulted in some differences from the categories that were used to calculate alcohol-attributable deaths and YLLs from New Zealand mortality data. See Table 3 (page 13) and Table 6 (page 17) for details about the condition and injury categories used for mortality analyses.

The mortality analyses described in the first section of this report included minor New Zealand-specific amendments to the ICD-10 codes that comprised the GBD condition and injury categories (see Appendix A and Appendix B for detailed explanations). However, similar adjustments to the specific ICD-10 codes used for each disease and injury category could not be made to the data that was provided directly by the WHO for our alcohol-attributable burden of disease and injury calculations.

The following text describes all other differences between condition and injury categories used for DALY calculations and those previously used for mortality calculations (detailed in the 'Methods: Alcohol-attributable mortality (2004 & 2007)' section). These differences were: the exclusion of six condition categories; the inclusion of one new category in a sensitivity analysis (i.e. unipolar depressive disorders); three instances where we adjusted WHO estimates to better match the categories used in our mortality analyses (i.e. ischaemic and haemorrhagic stroke, colon and rectum cancer, and lower respiratory infections); and two instances where we combined YLL and YLD estimates that were based on slightly different categories since it was not possible to modify the WHO estimates to match the more accurate categories used in our mortality analyses (i.e. cirrhosis of the liver and poisoning).

Laryngeal cancer, cardiac arrhythmias, oesophageal varices, cholelithiasis, pancreatitis, and fetal alcohol syndrome

The categories that were excluded from our burden of disease and injury analysis due to the absence of corresponding GBD categories were: laryngeal cancer, cardiac arrhythmias, oesophageal varices, cholelithiasis, pancreatitis, and fetal alcohol syndrome. These are the same categories that were excluded from the DALY analyses of the NZBoA2000/02 report.

Unipolar depressive disorders

Since unipolar depressive disorders were excluded from the mortality analysis (see page 35 for detailed rationale) and the alcohol-attributable section of the GBD 2005/2010 study[2] due to the lack of available data for RR and AAF estimates, unipolar depressive disorders were also excluded from our main burden of disease and injury analysis. However, the substantial impact of unipolar depressive disorders on non-fatal population health outcomes has been well-documented[47] and there is sufficient evidence for a causal relationship between alcohol consumption and unipolar depressive disorders.[2] Therefore, we chose to include unipolar depressive disorders in a sensitivity analysis of our DALY calculations by using a direct method to estimate depression AAFs. For depression AAF calculation details, please see page 59 in the 'AAF calculation methods (by age/sex)' section.

Stroke, ischaemic or haemorrhagic

Estimates of the non-fatal stroke subtype proportions for each age/sex subgroup were calculated using the same data and methods as described for fatal stroke subtypes (see page 14 in the previous 'Methods: Alcohol-attributable mortality (2004 & 2007) ' section), except that the one-month case-fatality rates were substituted with their inverse values (86% and 55% for ischaemic and haemorrhagic stroke, respectively) in order to calculate non-fatal stroke proportions. The final non-fatal stroke subtype proportions that were used for each age/sex subgroup are shown in Table 21, and were similar to the Wpr-A estimates[7] (see Table 22). These proportions were applied to the WHO estimates of YLDs for the broad 'cerebrovascular diseases' GBD category (ICD-10 codes I60–I67, I69) to calculate ischaemic and haemorrhagic stroke morbidity in New Zealand during 2004.

Table 21: New Zealand-based estimates of the proportion of non-fatal stroke subtypes, by age and sex.

	Males		Females	
Age group (years)	Ischaemic (%)	Haemorrhagic (%)	Ischaemic (%)	Haemorrhagic (%)
30–44	79.3	20.7	76.2	23.8
45–59	83.4	16.6	80.3	19.7
60–69	86.8	13.2	83.6	16.4
70–79	89.5	10.5	86.3	13.7

Table 22: Wpr-A subregion estimates of the proportion of non-fatal stroke subtypes, by age.

Age group (years)	Ischaemic (%)	Haemorrhagic (%)
30–44	78	22
45–59	82	18
60–69	85	15
70–79	88	12

Colon and rectum cancer

The GBD 2005/2010 study considers colon and rectum cancers together as a single category (ICD-10 codes C18–C21).[6] Since we had access to specific RRs and therefore specific AAFs for colon cancer and rectum cancer, the WHO New Zealand estimates from this broader 'colon and rectum cancers' category needed to be apportioned among our colon cancer and rectum cancer categories. The following calculations were performed separately for each age/sex/ethnicity subgroup.

The WHO estimates of 2004 YLDs for the 'colon and rectum cancers' category were multiplied by the relative proportions of incident colon cancer versus incident rectum cancer in New Zealand during 2004 (see Table 23).[51] These calculations produced separate WHO YLD estimates for colon cancer and rectum cancer to which their independent AAFs could be applied for the burden of disease and injury calculations.

Table 23: Proportions of incident cases of colon and rectum cancer for New Zealand, by age and sex (2004).*

	Age group (years)				
	15–29	30–44	45–59	60–69	70–79
Incident cases					
Males					
Colon cancer	75.0%	45.9%	44.0%	60.6%	66.7%
Rectum	25.0%	54.1%	56.0%	39.4%	33.3%
Females					
Colon cancer	77.8%	62.5%	59.2%	67.0%	77.0%
Rectum	22.2%	37.5%	40.8%	33.0%	23.0%

* Proportions calculated from the incident cases of primary colon and rectum cancer diagnosed and reported to the New Zealand Cancer Registry in 2004.[51]

Cirrhosis of the liver

Since the alcohol-attributable mortality analyses included only alcoholic liver cirrhosis (ICD-10 code K70), 100% AAFs were used for the YLL calculations. However, the WHO YLD estimates used a broader 'cirrhosis of the liver' category that also included non-alcoholic chronic hepatitis, fibrosis and cirrhosis of the liver (ICD-10 codes: K70, K73–K74).[6] Therefore, morbidity relative risk estimates for this broader 'cirrhosis of the liver' category were used to calculate morbidity AAFs for the alcohol-attributable YLD calculations (see Table 26 on page 59; RRs provided by the Global Burden of Disease 2010 Risk Factors Collaborating Group).

Lower respiratory infections

The calculations in the alcohol-attributable mortality section were based on a subset (J10–J18) of the ICD-10 codes included in the overall GBD 'lower respiratory infections' category (J09–J22, J85, P23).

In order to adjust for this substantial difference in categorisation, New Zealand mortality data were used to calculate the proportion of lower respiratory infection deaths in the overall GBD category that were due to partially alcohol-attributable causes:

$$\frac{\textit{Number of deaths due to ICD-10 codes J10–J18}}{\textit{Number of deaths due to ICD-10 codes J09–J22, J85 \& P23}} \quad (4)$$

This proportion was calculated separately for each age/sex subgroup by combining New Zealand mortality data from 2004 and 2007 (necessary due to small numbers of deaths in several age/sex subgroups). The proportions of lower respiratory infection deaths due to ICD-10 codes J10–J18 ranged from 85.7% to 100.0% for both men and women (see Appendix F).

All WHO YLD estimates for the broad GBD 'lower respiratory infections' category were then multiplied by the corresponding proportions from Appendix F. This resulted in adjusted YLD estimates that were specific to partially alcohol-attributable lower respiratory infections, to which we could apply the AAFs.

Poisonings

Our alcohol-attributable mortality analyses divided poisonings into two categories: alcohol poisonings and non-alcohol poisonings (see Table 6 on page 17 for specific ICD-10 codes). However, the GBD 'poisonings' category used for the WHO DALY estimates included only accidental poisoning by and exposure to non-alcoholic noxious substances (ICD-10 codes X40–X44, X46–X49).[6]

The three ICD-10 codes we categorised as 'alcohol poisonings' in the mortality section of this report are not grouped together in the GBD cause categories. X45 (accidental poisoning by and exposure to alcohol) is classified as a mental and behavioural disorder, X65 (intentional self-poisoning by and exposure to alcohol) is classified as a self-inflicted injury, and Y15 (poisoning by and exposure to alcohol, undetermined intent) is classified as an ill-defined 'garbage code'.[6] The eight ICD-10 codes we previously categorised as 'non-alcohol poisonings' (Y10–Y14, Y16–Y18: poisoning by and exposure to non-alcoholic noxious substances, undetermined intent) were similarly classified by the GBD study as ill-defined 'garbage codes'.[6]

Since these additional ICD-10 codes are dispersed among so many different GBD categories, it was not possible to adjust the WHO estimates to better correspond with the poisoning categories used for our mortality analyses. Instead, we calculated 'poisoning' DALYs by combining the New Zealand YLL estimates (sum of YLLs from the 'alcohol poisoning' and 'non-alcohol poisonings' categories used in our mortality analyses) with the WHO YLD estimates for the narrower GBD 'poisonings' category.

We chose to use the New Zealand YLL estimates since they were calculated from more accurate mortality data than the WHO YLLs. When we compared the 2004 New Zealand mortality estimates obtained from WHO and Statistics New Zealand, the total number of poisoning deaths estimated by WHO (using the narrower GBD 'poisonings' category) accounted for approximately 70% of the total number of alcohol and non-alcohol poisoning deaths reported by Statistics New Zealand.

As the WHO YLD estimates were based only on unintentional non-alcohol poisonings, they underestimate the actual New Zealand YLDs caused by poisonings. However, these were the only YLD estimates available at the time of this report. Furthermore, considering that the proportion of alcohol-attributable YLDs due to poisonings in the NZBoA2000/02 report was less than 0.2% of alcohol-attributable YLDs due to all causes, the impact on the final results should be negligible.

BURDEN OF DISEASE AND INJURY DATA

Population subgroups examined

2004 WHO burden of disease and injury data for New Zealand were available for the same age/sex subgroups examined in our mortality analyses. However, we were unable to calculate the alcohol-attributable burden of disease and injury separately for Māori and non-Māori subgroups since ethnicity-specific WHO estimates were not available.

New Zealand estimates (alcohol consumption and YLLs)

Alcohol consumption

The 2004 New Zealand alcohol consumption prevalence estimates used for AAF calculations in our alcohol-attributable mortality analyses were discussed in the previous 'Mortality and alcohol consumption data' section (see Tables 7–10 and Table E-3–Table E-6 in Appendix E for these original ethnicity-specific alcohol consumption prevalence estimates). WHO data limitations meant that alcohol-attributable DALYs could not be calculated separately for Māori and non-Māori New Zealanders, so morbidity AAFs were needed for the total New Zealand population (i.e. all ethnicities) by age/sex subgroup for the year 2004.

The total population alcohol consumption prevalence estimates required for producing these total New Zealand AAF estimates were calculated by using New Zealand census populations (as at 30 June 2004) for each age/sex/ethnicity subgroup to weight the 2004 Māori and non-Māori alcohol consumption prevalence estimates. Since the New Zealand non-Māori population is significantly larger than the Māori population in all age/sex subgroups, the total New Zealand prevalence estimates used for the burden of disease analyses correspond closely with the non-Māori prevalence estimates used in the previous mortality analyses. Māori alcohol consumption in the younger age

groups had the greatest influence on the total New Zealand estimates, as the ratio of Māori: non-Māori New Zealanders increases considerably with age (i.e. 4.5:1 for 15–29 year olds, 9:1 for 45–59 year olds, and 20:1 for 70–79 year olds).

The 2004 total New Zealand population alcohol consumption prevalence estimates used to estimate the AAFs for all conditions except ischaemic heart disease are shown in Table 24, while Table E-7 (Appendix E, page 144) details the total New Zealand estimates used for ischaemic heart disease AAF calculations. The estimates for alcohol consumption during pregnancy for all New Zealand women are shown in Table 25.

Table 24: Estimated average volume of alcohol consumption for New Zealand males and females (%), 2004.

	Alcohol consumption category	Grams alcohol per day	Age group (years)*				
			15–29†	30–44†	45–59†	60–69‡	70–79‡
Males	Abstainers	0	10.2	4.9	5.4	5.3	7.0
	Ex-drinkers	0	3.0	6.0	8.8	9.5	10.2
	I	0.01–39.99	57.3	74.6	72.3	73.4	72.9
	II	40.00–59.99	8.7	7.7	6.4	6.0	5.5
	III	60+	20.8	6.8	7.1	5.8	4.4
Females	Abstainers	0	11.4	8.7	10.9	12.9	19.1
	Ex-drinkers	0	5.2	7.1	6.8	12.7	13.9
	I	0.01–19.99	60.3	69.0	66.8	63.9	59.4
	II	20.00–39.99	13.2	10.5	11.5	8.1	6.2
	III	40+	10.0	4.7	4.0	2.4	1.5

* All estimates weighted by 2004 population sizes of ethnic subgroups. Sums of age/sex/ethnicity subgroup proportions may not equal exactly 100% due to rounding.
† Estimates from HBS2003/04.
‡ Extrapolated estimates from weighted averages of proportions from HBS2003/04, NZADUS2007/08 and HtO2008/09 surveys. See the report section: 'Alcohol consumption estimates for older age categories' on page 36 for details about calculation methods and limitations of extrapolated estimates (i.e. high degree of uncertainty).

Table 25: Estimated average volume of alcohol consumption during pregnancy for New Zealand females (%), 2004.[*]

	Alcohol consumption category	Grams alcohol per day	Age group (years)		Total
			15–29	30–44	15–44
Abstainers	0	74.8	68.9		71.6
I	0.01 – 19.99	18.4	25.5		21.9
II	20.00 – 39.99	3.4	3.7		3.5
III	40+	3.4	1.9		3.0

[*] All estimates weighted by 2004 population sizes of ethnic subgroups. Sums of age/sex subgroup proportions may not equal exactly 100% due to rounding.

YLLs

Methods and results for the 2004 YLLs calculated from New Zealand data have been discussed elsewhere (see the 'Alcohol-attributable years of life lost (YLLs)' methods section on page 48). All modifications to condition and injury categories that were necessary when using New Zealand YLLs for the burden of disease and injury calculations have also been previously detailed in the 'Differences in alcohol-attributable condition and injury categories between mortality and DALY analyses' section (starting on page 50).

Since alcohol-attributable DALYs could not be calculated by ethnicity, the ethnicity-specific alcohol-attributable YLL results previously calculated from New Zealand 2004 mortality data were collapsed into age/sex subgroups for use in the burden of disease and injury calculations. In this way, even though the YLLs used in the DALY calculations could not be grouped by ethnicity, we were still able to use the most accurate ethnicity-specific AAFs when calculating the alcohol-attributable YLLs from the 2004 New Zealand mortality data.

World Health Organization estimates

The age-weighting and time-discounting methodology used to calculate the WHO burden of disease and injury estimates is described in the 2004 global health risks report,[48] and is the same method used to calculate YLLs from New Zealand data in the mortality section of this report (see page 48).

Deaths and YLLs

The WHO provided us with estimates of deaths, years of life lost (YLLs) and years lived with disability (YLDs) for New Zealand for the most recent year available (2004). These estimates were provided for the Global Burden of Disease categories of conditions and injuries, resulting in some differences from the more specific cause categories used in our mortality analyses (please see the 'Differences in alcohol-attributable condition and injury categories between mortality and DALY analyses' section starting on page 50 for details about category differences).

Whereas the 2004 New Zealand YLLs were calculated directly from New Zealand ICD-10 coded mortality data for 2004, the YLL estimates provided by the WHO were based on GBD estimates of New Zealand deaths during 2004. WHO used New Zealand 2003 vital registration data from to derive their estimates of New Zealand deaths by cause, age and sex for the year 2004.[47] Further details of methods used by the GBD to estimate mortality are described elsewhere.[6,47]

A comparison of Statistics New Zealand mortality data and WHO's mortality estimates for New Zealand showed that the numbers of deaths for the cause categories included in our report were very similar between the two data sources (see Appendix G for detailed numbers). Since the Statistics New Zealand mortality data coding allows for the use of more accurate cause categories, we decided to use the Statistics New Zealand mortality data to estimate alcohol-attributable YLLs for our burden of disease analysis.

YLDs

Morbidity due to incident cases of a given health condition can be measured by the number of years lived with a disability or poor health (YLDs) due to that condition. For each age/sex subgroup and cause of death, the general formula used to calculate YLDs is:

$$\textit{Years of life lived with a disability (YLD)} = I \times D \times L, \quad (5)$$

where *I* is the number of incident cases during the year of interest, *D* is the disability weight (ranging from 0 to 1 to reflect the severity of the disability, where 0 is perfect health and 1 is death), and *L* is the average duration of the disability in years.[6] Equation 5 ignores the additional complications of 3% time-discounting and age-weighting that were previously discussed for YLLs (see page 48) and for which methodological details can be found elsewhere.[47,48]

The Global Burden of Disease and Risk Factors report describes YLD estimation as "the most complex and time-consuming component of burden of disease analysis, because it requires systematic assessments of the available evidence on incidence, prevalence, duration, and severity of a wide range of conditions" (p. 73).[52] Since these data are not currently readily available from New Zealand sources, the calculation of YLDs is beyond the scope of this report. Therefore, we chose to base our estimates of alcohol-attributable morbidity on the YLDs estimated by WHO for alcohol-related conditions and injuries in New Zealand age/sex subgroups in 2004.

MORTALITY AND MORBIDITY ALCOHOL-ATTRIBUTABLE FRACTIONS (AAFS): FOR CALCULATING ALCOHOL-ATTRIBUTABLE DALYS

The 2004 burden of disease and injury due to alcohol was estimated for New Zealand as disability-adjusted life years (DALYs). These were calculated by adding measures of alcohol-attributable mortality (New Zealand YLLs) and alcohol-attributable morbidity (WHO YLDs). As mentioned previously, these burden of disease and injury calculations could only be performed by age/sex subgroup since ethnicity-specific estimates were not available from the World Health Organization.

AAF calculation methods (by age/sex)

Wholly alcohol-attributable conditions and injuries

As for the alcohol-attributable mortality analyses, conditions and injuries that are entirely caused by the consumption of alcohol all have AAFs of 100 percent.

Partially alcohol-attributable conditions

AAF calculation methods have been described in the 'Mortality alcohol-attributable fractions' section (starting on page 34). Mortality AAFs were calculated from alcohol consumption estimates for each age/sex/ethnicity subgroup. However, since the WHO YLD estimates used in our DALY analyses were available by age/sex subgroup (but not ethnicity), the morbidity AAFs were calculated from New Zealand alcohol consumption estimates for each age/sex subgroup (these estimates are detailed in Tables 24 and 25).

For several alcohol-related conditions, a differential impact of alcohol consumption has been shown for mortality and morbidity outcomes, with the effects of alcohol mostly stronger and more harmful for mortality than morbidity.[2] The conditions for which the Global Burden of Disease 2010 Risk Factors Collaborating Group provided sex-specific morbidity RRs to calculate morbidity alcohol-attributable fractions (AAFs) were: ischaemic stroke and haemorrhagic stroke, cirrhosis of the liver, and ischaemic heart disease. Following GBD methodology,[53] the morbidity AAFs calculated from these morbidity RRs were applied to YLDs to calculate alcohol-attributable morbidity due to each condition by age/sex subgroup. For all other conditions for which separate morbidity RRs were not available, age/sex-specific mortality AAFs were calculated and applied to YLDs as best available estimates of the morbidity AAFs.

Relative risk estimates (mortality and morbidity)

The morbidity RR estimates used in the burden of disease AAF calculations that differed from the mortality RRs used in the previous mortality AAF calculations are shown in Table 26 and Table 27. Table 26 shows the sex-specific morbidity RRs for ischaemic stroke, haemorrhagic stroke, and cirrhosis of the liver. In contrast to the previous alcohol-attributable mortality analyses that included only alcoholic liver cirrhosis (ICD-10 code K70; 100% AAF), the RRs used to calculate the morbidity AAFs for the broader GBD 'cirrhosis of the liver' category also include non-alcoholic chronic hepatitis, fibrosis, and cirrhosis of the liver (ICD-10 codes K70, K73 and K74). Table 27 shows the morbidity RRs for ischaemic heart disease in males and females.

Most conditions with different mortality and morbidity RRs showed more harmful associations with alcohol for mortality. However, for the average alcohol consumption categories I and II, the female morbidity RRs for ischaemic stroke were slightly less protective than the corresponding mortality RRs. For ischaemic and haemorrhagic stroke, the difference between morbidity and mortality RRs was only pronounced for females.

Table 26: Morbidity relative risks[*] for partially alcohol-attributable (non-injury) conditions, excluding ischaemic heart disease.

	Average daily alcohol consumption[†]							
	Males				Females			
	Ex	I	II	III	Ex	I	II	III
Ischaemic stroke	1.33	0.90	1.08	1.25	1.15	0.82	0.89	1.08
Haemorrhagic stroke	1.33	1.17	1.47	1.78	1.15	0.68	0.90	1.32
Cirrhosis of the liver	1.31	1.41	2.33	3.55	6.50	2.12	3.64	5.74

[*] This table only includes RRs that differ from the mortality RRs previously detailed in Table 13 (see page 47).
[†] Alcohol consumption categories measured in average grams of pure alcohol consumed per day.
Males: Ex: 0 g (ex-drinkers), I: 0.01−39.99 g, II: 40−59.99 g, and III: 60+ g.
Females: Ex: 0 g (ex-drinkers), I: 0.01−19.99 g, II: 20−39.99 g, and III: 40+ g.

Table 27: Morbidity relative risks for ischaemic heart disease.[*]

Average daily alcohol consumption	Males	Females
Abstainers	1.00	1.00
Ex-drinkers[†]	0.99	1.11
0.01–19.99 g/day	0.75	0.68
20–39.99 g/day	0.70	0.62
40–59.99 g/day	0.76	0.81
60+ g/day	0.66	1.48

[*] RRs provided by Roerecke and Rehm.[37] In addition to these RRs, excess proportions of people with irregular heavy drinking occasions were assigned RRs of 1.00 (see Appendix E for details).
[†] RRs for ex-drinkers are from a separate analysis.[2]

Unipolar depressive disorders (for sensitivity analysis)

The 2004 Global Burden of Disease report showed that depression, despite being a mostly non-fatal condition, made a substantial contribution to the global burden of disease.[47] Unipolar depressive disorders were the leading global cause of years lost due to disability (YLDs), and were also the leading cause of burden of disease (DALYs) in high-income countries.[47] Unipolar depressive disorders were thus included in the previous NZBoA2000/02 report.[1] However, depression has been excluded from our main mortality and DALY analyses following the GBD alcohol group's conclusion that there are currently no validated approaches to calculate depression AAFs, and it has been

dropped from the GBD 2005/2010 study (J. Rehm, personal communication). Given that the contribution of depression to the alcohol-attributable burden of disease is not contested, we chose to include depression in a sensitivity analysis that used a direct method to estimate depression AAFs for New Zealand. This allowed a rough estimate of alcohol-attributable YLDs caused by unipolar depressive disorders to be calculated that is comparable with the estimate in the previous NZBoA2000/02 report.

The comparative risk assessment group of the GBD 2000 study estimated depression AAFs from the prevalence of alcohol dependence in different subregions of the world.[17] Therefore, we calculated New Zealand-specific depression AAF estimates by adjusting the Wpr-A subregion AAF estimates (for 15 years and older) by the prevalence of alcohol dependence in New Zealand using the following equation:

$$AAF_{(NZ\ subgroup)} = AAF_{(WPR-A)} \times \frac{Prevalence\ of\ alcohol\ dependence\ (NZ\ subgroup)}{Prevalence\ of\ alcohol\ dependence\ (WPR-A)}$$

(6)

where,

$AAF_{(Wpr\text{-}A)}$ = 3.84% for men, and 1.31% for women
Prevalence of alcohol dependence$_{(Wpr\text{-}A)}$ = 3.12% for men, and 1.12% for women

Unipolar depressive disorder AAFs were calculated separately for each New Zealand age/sex subgroup by using 12-month prevalence estimates of alcohol dependence provided by Te Rau Hinengaro: The New Zealand Mental Health Survey (see Table 28) in equation 6.[21]

Table 28: 12-month prevalence of alcohol dependence* for New Zealand (%), by age and sex (2003/04).

	Age group (years)				
	16–29	**30–44**	**45–59**	**60–69**	**70–79**
Males	4.21	1.68	0.74	0.03	0.00
Females	1.99	1.03	0.26	0.01	0.00

* The New Zealand Mental Health Survey used a nationally representative sample to determine the prevalence of alcohol dependence in 2003/04. Twelve-month prevalence was the proportion of people to have ever met criteria for alcohol dependence and to have experienced an episode or key symptoms in the 12 months before the interview. Survey interviews used the Composite International Diagnostic Interview (CIDI 3.0) structured questionnaire to make DSM-IV diagnoses of alcohol dependence.[21]

Partially alcohol-attributable injuries

Injury mortality AAFs were calculated by age/sex subgroup as the ratio of alcohol-attributable deaths to annual deaths in each subgroup (Māori and non-Māori deaths combined). Mortality data from 2004 and 2007 were used since the ethnicity-specific AAFs were the same for both years.

As in the NZBoA2000/02 report, AAFs for adult non-fatal road traffic injuries were the same as for fatal road traffic injuries (this decision was based on New Zealand data from the Auckland Car Crash Injury Study).[54] For children under 15 years old, morbidity AAFs for road traffic injuries were estimated

directly from New Zealand statistics that showed that 11% of total road traffic injuries in children were related to alcohol between 2003 and 2007 (after adjustment for under-reporting and under-measurement of alcohol).[42] All non-road traffic injury morbidity AAFs were 4/9 of their corresponding mortality AAFs (for both children and adults).[17]

Morbidity AAF estimates

Alcohol-attributable condition and injury AAFs

The 2004 morbidity alcohol-attributable fraction (AAF) estimates for male and female New Zealanders are shown by age category in Table 29 (conditions) and Table 30 (injuries). These morbidity AAFs were applied to WHO YLDs to calculate alcohol-attributable YLDs.

CALCULATING ALCOHOL-ATTRIBUTABLE DISABILITY-ADJUSTED LIFE YEARS (DALYS)

To determine the number of DALYs that were attributable to alcohol in New Zealand during 2004, we performed the following calculations:

1. **Alcohol-attributable YLLs**
   Mortality AAFs for each alcohol-related condition (Tables 15–18) and injury (Tables 19–20) were multiplied by the total number of corresponding YLLs (calculated from 2004 New Zealand data) in each age/sex/ethnicity subgroup. Māori and non-Māori alcohol-attributable YLLs were then combined to produce alcohol-attributable YLLs by age/sex subgroup.

2. **Alcohol-attributable YLDs**
   Morbidity AAFs for each alcohol-related condition (Table 29) and injury (Table 30) were multiplied by the total number of corresponding YLDs (calculated from 2004 World Health Organization data) in each age/sex subgroup.

3. **Alcohol-attributable DALYs**
   Calculated by summing **alcohol-attributable YLLs** and **alcohol-attributable YLDs** for each alcohol-related condition and age/sex subgroup.

Table 29: 2004 morbidity AAFs for (non-injury) conditions: Total New Zealand population.[*]

	Males							Females						
	0–4	5–14	15–29	30–44	45–59	60–69	70–79	0–4	5–14	15–29	30–44	45–59	60–69	70–79
Mouth and oropharyngeal cancers[†]			57.2%	47.9%	47.2%	45.7%	43.8%			36.9%	31.7%	31.1%	28.2%	25
Oesophagus cancer†			37.6%	29.7%	29.3%	28.2%	26.7%			21.7%	18.7%	18.2%	17.4%	16.0%
Colon cancer†			6.5%	5.6%	6.0%	6.0%	5.8%			5.0%	5.3%	5.1%	7.0%	7.2%
Rectum cancer†			11.3%	9.3%	9.5%	9.3%	8.9%			7.4%	7.2%	7.0%	8.5%	8.4%
Liver cancer†			20.3%	16.6%	16.5%	16.1%	15.4%			12.5%	11.4%	11.1%	11.8%	11.3%
Female breast cancer†										15.3%	13.5%	13.1%	13.3%	12.6%
Alcohol use disorders†	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Unipolar depressive disorders[‡]			5.2%	2.1%	0.9%	0.0%	0.0%			2.3%	1.2%	0.3%	0.0%	0.0%
Epilepsy†			36.0%	28.4%	28.1%	27.0%	25.6%			20.8%	18.1%	17.6%	17.0%	15.7%
Hypertensive heart disease†			26.8%	20.6%	20.0%	19.2%	18.0%			18.6%	8.2%	7.6%	2.8%	0.4%
Ischaemic heart disease			-31.3%	-31.0%	-29.5%	-29.2%	-27.9%			-27.3%	-32.9%	-33.5%	-29.0%	-25.2%
Ischaemic stroke			1.4%	-3.0%	-1.8%	-2.0%	-2.2%			-11.8%	-13.5%	-13.3%	-11.2%	-9.8%
Haemorrhagic stroke			23.6%	18.9%	19.0%	18.5%	17.7%			-20.3%	-26.2%	-25.7%	-23.2%	-20.8%
Cirrhosis of the liver (K70, K73 & K74)			47.0%	37.4%	37.0%	35.7%	33.8%			64.0%	62.4%	61.7%	63.5%	62.4%
Low birth weight†	4.3%							4.4%						
Tuberculosis†			36.8%	23.0%	22.1%	20.1%	17.6%			17.9%	11.1%	9.8%	9.3%	8.3%
Lower respiratory infections:			15.0%	12.1%	12.2%	11.9%	11.3%			9.3%	8.7%	8.4%	9.7%	9.4%
Diabetes mellitus†			-5.0%	-8.6%	-7.6%	-7.7%	-7.7%			-24.8%	-30.7%	-30.7%	-26.8%	-23.6%

[*] These AAFs were used for calculating 2004 alcohol-attributable YLDs. AAF estimates for 60+ years have more uncertainty due to smaller sample sizes and the use of extrapolated alcohol consumption estimates.
[†] Morbidity AAFs for these condition categories were calculated by using mortality RRs as best available estimates of morbidity RRs.
[‡] Unipolar depressive disorder AAFs were only used for our sensitivity analysis.

Table 30: 2004 morbidity AAFs for injuries: Total New Zealand population.[*]

	Males							Females						
	0–4	**5–14**	**15–29**	**30–44**	**45–59**	**60–69**	**70–79**	**0–4**	**5–14**	**15–29**	**30–44**	**45–59**	**60–69**	**70–79**
Road traffic injuries	11.0%	11.0%	46.0%	45.8%	15.3%	9.6%	9.5%	11.0%	11.0%	28.4%	27.2%	7.7%	2.3%	2.3%
Non-alcohol			17.9%	9.4%	9.4%	9.9%	4.2%			15.5%	8.3%	7.9%	7.7%	3.6%
Falls			12.5%	13.2%	13.0%	9.5%	6.5%			7.2%	7.2%	8.1%	5.0%	2.1%
Fires	10.7%	10.7%	15.4%	19.2%	19.1%	17.0%	14.9%	10.7%	10.7%	11.8%	11.8%	12.2%	12.2%	9.8%
Drownings			15.0%	19.4%	19.4%	13.9%	13.3%			12.8%	19.3%	15.4%	12.3%	12.3%
Other unintentional	11.5%	10.1%	17.2%	17.0%	13.9%	13.9%	13.7%	3.4%	3.9%	13.3%	12.4%	10.9%	9.8%	9.8%
Self-inflicted injuries			8.0%	8.0%	5.8%	5.8%	2.7%			5.1%	5.1%	4.1%	4.1%	2.6%
Assault	8.4%	11.1%	17.4%	17.4%	16.0%	17.9%	14.3%	9.7%	7.2%	14.9%	15.9%	15.2%	13.9%	13.9%
Other intentional			10.6%	10.6%	10.6%	10.6%	5.3%			10.3%	10.3%	10.3%	10.3%	5.1%

[*] Except for road traffic injuries, injury morbidity AAFs were derived by multiplying the corresponding mortality AAFs by 4/9. These AAFs were used for calculating 2004 alcohol-attributable YLDs. AAF estimates for 60+ years have more uncertainty due to smaller sample sizes and the use of extrapolated alcohol consumption estimates.

[†] See 'Poisonings' section starting on page 63 for a detailed explanation of why we were unable to use 100% AAFs for 'alcohol poisonings' in the YLD calculations.

METHODOLOGICAL DEVELOPMENTS

The estimates in this report were calculated with the best data sources and most up-to-date calculation methods available to us at the time of writing. Our basic approach to calculating the impact of alcohol on the health of New Zealanders was broadly similar to the approach used in the previous NZBoA2000/02 report.[1] However, in the eight years since the publication of the NZBoA2000/02 report, the methods used for calculating the alcohol-attributable burden of disease and injury have been undergoing constant revision and scrutiny by the Global Burden of Disease 2010 Risk Factors Collaborating Group.[2] This has resulted in some changes to the methods used for the calculations compared to those used for the NZBoA2000/02 report. Therefore, any differences in results between the reports are due to a combination of several factors (see below) and must not be interpreted as having occurred solely due to changes in alcohol consumption of New Zealanders.

Several of the main differences in methods between this report and the NZBoA2000/02 report are briefly outlined below. The rationale for these methodological changes has been previously documented with additional details and references in the relevant sections of this report.

ALCOHOL-ATTRIBUTABLE CONDITIONS

This report includes four alcohol-attributable conditions that were not included in the NZBoA2000/02 report: colon cancer, rectum cancer, tuberculosis, and pneumonia. See Table 3 on page 13 for ICD-10 coding details.

ALCOHOL CONSUMPTION ESTIMATES

The surveys used to estimate alcohol consumption for the NZBoA2000/02 report[55] and the 2004 section of this report[20] were both conducted by the Centre for Social Health Outcomes Research and Evaluation and used similar methods. However, the survey used to estimate alcohol consumption in 2007 for this report[25] was conducted by the Ministry of Health using different methods. This means that comparisons between the prevalence of alcohol consumption in age/sex/ethnic subgroups of New Zealanders across survey years may not reflect only differences in annual consumption but also methodological differences.

We did not include people aged 80 years and older in our analyses due to the unreliability of the estimates of both alcohol consumption and relative risks for this age category, whereas this age category was included in the NZBoA2000/02 report. This methodological difference means that many of the totals presented in the results sections of the two reports are not directly comparable, especially for conditions and injuries that are common in older age groups (e.g. cardiovascular conditions and falls).

ALCOHOL-ATTRIBUTABLE FRACTION CALCULATIONS

Unipolar depressive disorders

Depression was excluded from the main analyses in this report. However, we did perform a sensitivity analysis that estimated morbidity AAFs for application to YLDs caused by unipolar depressive disorders. Depression AAFs were calculated by adjusting Wpr-A depression AAF estimates[17] by the proportion of

alcohol dependence in each New Zealand age/sex subgroup[21] compared with the reported sex-specific prevalence of alcohol dependence in Wpr-A. The 12-month New Zealand prevalence estimates of alcohol-dependence were obtained from a 2003/04 nationally representative survey of New Zealanders 16 years and older (Te Rau Hinengaro: The New Zealand Mental Health Survey).[21]

In contrast, the best data available for estimating depression AAFs in the NZBoA2000/02 report were six-month prevalence estimates of alcohol abuse and/or dependence for New Zealanders between 18 and 64 years old (from a small study conducted in Christchurch during 1986).[1,56]

Relative risk estimates

Alcohol consumption categories

The 'abstainer' reference category used in this report included only lifetime abstainers, with ex-drinkers included as a separate alcohol consumption category to reflect the (usually) increased health risks of ex-drinkers compared to lifetime abstainers.[2] The NZBoA2000/02 report included ex-drinkers in the abstainer reference category.

Updated relative risk estimates

Since the publication of the NZBoA2000/02 report, new systematic reviews and meta-analyses performed as part of the Global Burden of Disease Risk Factors Assessment for alcohol have further clarified the associations between alcohol and several conditions.[2] This has resulted in a number of substantial differences in the relative risk (RR) values used to calculate alcohol-attributable fractions. A detailed sex-specific comparison of RR estimates used for each condition and alcohol consumption category is beyond the scope of this report. However, some of the main changes to the RR estimates for a given alcohol consumption category (without accounting for the impact of the inclusion of the additional 'ex-drinker' category) include: mostly decreased RRs for cancers, cardiac arrhythmias, pancreatitis, epilepsy, liver cirrhosis, and hypertensive heart disease; mostly increased RRs for haemorrhagic stroke; and more protective RRs for diabetes at the lowest level of alcohol consumption with increased risk for the heaviest drinkers. For more details, please compare the RR estimates in Table 9 (page 23) of the NZBoA2000/02 report with the RR estimates shown in Table 13 (page 36) and Table 14 (page 39) of this report.

Stroke (ischaemic or haemorrhagic)

In this report, we used specific ischaemic and haemorrhagic stroke relative risk estimates for mortality and morbidity (see pages 14 and 51 for methods used to estimate specific stroke subtype proportions from mortality and morbidity data). The NZBoA2000/02 report applied 'total stroke' relative risk estimates to combined mortality data for all stroke subtypes.

Morbidity AAF estimates

Alcohol-attributable conditions

In this report, morbidity RRs were available for the calculation of specific morbidity AAFs for ischaemic stroke and haemorrhagic stroke, cirrhosis of the liver, and ischaemic heart disease. For all other non-injury conditions, mortality RRs were used as the best available estimates of morbidity RRs for the morbidity AAF calculations. The NZBoA2000/02 report used only mortality RRs to calculate the best available estimates of morbidity AAFs for all alcohol-attributable conditions.

Incorporating drinking patterns into AAF calculations

Summary

Both this report and the NZBoA2000/02 report used drinking pattern information (along with average volume of alcohol consumption) in the AAF calculations for ischaemic heart disease and injuries. However, the analytical methods used to incorporate the impact of drinking patterns differed markedly between reports.

NZBoA2000/02

A 'pattern of drinking' scoring system developed by the Comparative risk assessment (CRA) group of the 2000 GBD study[17] was used to classify the overall drinking pattern of Māori versus non-Māori populations (see Table 1 on page 16 of the NZBoA2000/02 report). This classification system was used to allocate different drinking pattern scores to non-Māori and Māori populations (pattern 2 and pattern 3, respectively), where a higher pattern score indicates more health risks for a given average volume of alcohol consumption.[1] This difference in drinking pattern score was due to Māori males and females scoring higher than their non-Māori counterparts on a single item in the WHO scoring system: usual quantity of drinks per drinking session. As noted by the WHO alcohol CRA group, the application of a single drinking pattern value to an entire population is an obvious oversimplification (i.e. instead of accounting for the drinking pattern differences between age/sex/ethnicity subgroups in a given population), but was deemed acceptable at the time due to the absence of any other better methods.[17]

Current report

We were able to incorporate drinking pattern information from specific age/sex/ethnicity subgroups into our AAF calculations for ischaemic heart disease by using a methodology that has been developed by the GBD 2010 Risk Factors Collaborating Group since the publication of the NZBoA2000/02 report.

Ischaemic heart disease

NZBoA2000/02

The broad Māori/non-Māori WHO drinking pattern scores did not account for the effect of different drinking patterns of age/sex subgroups when estimating the complex impact of alcohol on ischaemic heart disease. Therefore, the NZBoA2000/02 report instead chose to apply relative risks (derived by the WHO alcohol CRA group from individual-level studies) to AAF calculations for both Māori and non-Māori age/sex subgroups.[1] This alternate approach proposed by the CRA group produced more conservative burden of disease estimates (i.e. higher cardioprotective effects) since all levels of male and female average alcohol consumption except the highest were considered protective, despite the fact that this protective relationship has been repeatedly questioned.[17]

Country-level analyses by the WHO alcohol CRA group did not show a marked impact of alcohol on ischaemic heart disease for countries with drinking pattern 2, whereas a detrimental alcohol impact had been shown for males in pattern 3 countries.[17] Therefore, in addition to the main NZBoA2000/02 analysis, where identical relative risk estimates were used to calculate Māori and non-Māori AAFs, the NZBoA2000/02 report also presented results from a sensitivity analysis which excluded any beneficial effect of alcohol on ischaemic heart disease for the Māori population.[1]

Current report

Our AAF calculations for ischaemic heart disease used methods recently developed for the GBD 2005/2010 study. These methods are based on recent meta-analyses that examined the relationship between ischaemic heart disease, average alcohol consumption,[37] and irregular heavy drinking occasions (HDOs),[35] and also showed the importance of separating ex-drinkers from abstainer reference groups.[36] The authors (Roerecke and Rehm) calculated sex-specific relative risk values for use in our study by using all available data points from the studies in the meta-analysis that provided sex-stratified estimates[37] and incorporated relative risks for ex-drinkers from a separate analysis.[2] This resulted in sex-specific relative risk values with lifetime abstainers as the reference category compared to ex-drinkers and four levels of average daily alcohol consumption (see Table 14 on page 39).

Roerecke and Rehm have clearly demonstrated the effect of drinking pattern on ischaemic heart disease risk, as the cardioprotective effect of mild to moderate average alcohol consumption (0.01–59.99 g/day) ceased to exist when combined with irregular HDOs (60+ g of pure alcohol per occasion, *at least monthly but not daily*).[35] However, the RRs calculated by Roerecke and Rehm for our study did not distinguish between regular drinkers and people with irregular HDOs for the mild to moderate consumption categories (0.01–19.99 g/day, 20–39.99 g/day and 40–59.99 g/day).[37] Therefore, to allow us to account for the detrimental effect of irregular HDOs in our analyses, Roerecke calculated the sex-specific proportions of people with irregular HDOs across several large studies used in their meta-analysis (15.7% for men and 1.4% for women; see Appendix E for details).[37] We assumed that these sex-specific proportions were accurate overall indicators of people with irregular HDOs in the studies used to calculate the RRs for average alcohol consumption. See Table E-2 (Appendix E) for a summary of the overall proportions of people with irregular HDOs in the 2004 and 2007 New Zealand sex/ethnicity subgroups. With the exception of 2004 non-Māori males, all New Zealand sex/ethnicity subgroups had higher proportions of people with irregular HDOs than the corresponding sex-specific proportions from the studies in the meta-analysis.

A relative risk of 1.0 (no cardioprotection compared to abstainers) was assigned to any *excess* proportion of people with irregular HDOs that was present in New Zealand sex/ethnicity subgroups, while the average consumption RRs were applied to the remainder of the drinkers. Conversely, when the proportion of people with irregular HDOs in the meta-analysis studies was greater than that of a New Zealand sex/ethnicity subgroup (i.e. 2004 non-Māori males), all people in the three average alcohol consumption categories between 0.01 and 59.99 g/day had the average consumption RRs applied to them. Since the proportion of people with irregular HDOs declined steadily with age in all sex/ethnicity subgroups, this adjustment for the impact of drinking pattern on ischaemic heart disease AAFs had the greatest impact on the younger age groups (which have very little ischaemic heart disease) and very little impact on the older age groups (see Appendix E for details). By choosing to assign RR = 1 only to the excess proportion of people with irregular HDOs, current evidence suggests that the AAFs we calculated for ischaemic heart disease probably underestimate the negative impact of irregular HDOs on ischaemic heart disease (M. Roerecke, personal communication).

Injuries

NZBoA2000/02

AAFs for road traffic injuries were estimated directly from New Zealand data (1998/99 Auckland Car Crash Injury Study).[54] For all other injury categories, non-Māori AAF estimates were obtained from Australian data and adjusted for the sex-specific differences in average per capita consumption between New Zealand and Australia (no adjustment for drinking pattern was necessary since both countries are classified as drinking pattern 2). To reflect the increased risk of acute injury mortality and morbidity in Māori drinkers (pattern 3) versus non-Māori drinkers (pattern 2), all Māori injury AAF estimates were then scaled up from the corresponding age/sex-specific non-Māori injury AAFs by a factor of 1.5.[1] This scaling factor was derived from the non-Māori and Māori injury AAFs calculated from the Auckland Car Crash Injury Study.

Current report

The injury AAFs used in our main analyses were mostly similar to those used in the NZBoA2000/02 report (for detailed rationale and methods, see 'AAFs for partially alcohol-attributable injuries' starting on page 39).

However, we have also included an injury burden sensitivity analysis that uses AAF calculation methods that have been developed by the Global Burden of Disease 2010 Risk Factors Collaborating Group since the NZBoA2000/02 report was written (see Appendix C for sensitivity analysis). The GBD injury AAF model incorporates both average alcohol consumption estimates and the following drinking pattern estimates: (1) prevalence of people with heavy drinking occasions (HDOs); (2) average number of HDOs per week; and (3) average number of drinks per HDO. Therefore, injury AAFs are calculated separately based on the drinking volumes and patterns found in each age/sex/ethnicity subgroup rather than relying on crude adjustments based on drinking patterns of entire Māori and non-Māori populations.

2007 MORTALITY RESULTS

OVERVIEW

This section presents our estimates for alcohol-attributable deaths and years of life lost (YLLs) in New Zealand during 2007. These mortality estimates are for New Zealanders aged 0–79 years, and are reported by:

- Sex (see page 69)
- Sex/ethnicity (see page 72)
- Age/sex (see page 77)
- Age/ethnicity (see page 81)
- Age/sex/ethnicity (see page 84).

Overall, 802 deaths in New Zealanders aged 0–79 years were attributed to alcohol consumption in 2007, representing 5.4% of all deaths under 80 years old. These deaths represented 13,769 YLLs attributable to alcohol.a Alcohol consumption was also estimated to prevent 351 deaths but only 3,095 YLLs. This was because the preventive effects were confined to conditions in older adults, while many deaths caused by alcohol occur in young people.

MORTALITY BY SEX (2007)

Deaths

For New Zealanders aged 0–79 years, the number of male deaths due to alcohol consumption (n = 537) was double the number of deaths in women (n = 265).

Table 31 shows how the top five causes of alcohol-attributable deaths differed for male and female New Zealanders. Road traffic injuries were the most common cause of alcohol-attributable deaths (n = 105) in men, while alcohol-attributable breast cancer deaths (n = 71) were the leading cause of death due to alcohol consumption in women. Alcoholic liver cirrhosis was among the most common causes of alcohol-attributable death for both sexes. Table 32 shows how injuries (including unintentional and intentional) were responsible for more than half of alcohol-attributable deaths in male New Zealanders, and most of the difference between males and females.

[a] We were unable to calculate the proportions of New Zealand YLLs that were attributable to alcohol in 2007 because GBD YLL denominator data were not available for 2007. Please see Table I- in 0 for 2004 estimates of proportions of YLLs due to alcohol consumption.

Table 31: Top five causes of alcohol-attributable (AA) deaths, by sex (0–79 years; 2007).

Males	% of AA deaths (N = 537)	Females	% of AA deaths (N = 265)
Road traffic injuries	19.6%	Female breast cancer	26.9%
Alcoholic liver cirrhosis	11.5%	Haemorrhagic stroke	10.8%
Self-inflicted injuries	10.5%	Alcoholic liver cirrhosis	9.8%
Other unintentional injuries	8.9%	Road traffic injuries	9.8%
Oesophagus cancer	6.3%	Colon cancer	7.1%

Table 32: Alcohol-attributable deaths due to cancer, other conditions, and injuries; by sex (0–79 years; 2007).

	Male deaths		Female deaths		Total deaths	
	N	%	N	%	N	%
Cancers	126	23.5%	117	44.1%	243	30.3%
Other conditions	132	24.5%	82	30.9%	213	26.6%
Injuries	280	52.1%	66	25.0%	346	43.1%

The numbers of deaths estimated to be prevented by low average volumes of alcohol consumption in New Zealand are shown in Table 33. Of all male deaths prevented by drinking (n = 226), almost 90% were due to alcohol drinking reducing the risk of ischaemic heart disease, while the deaths prevented by female drinking (n = 125) were more evenly distributed between ischaemic heart disease, ischaemic stroke, and diabetes.

Table 33: Male and female deaths prevented by alcohol consumption, by condition (0–79 years; 2007).

	Male deaths prevented		Female deaths prevented		Total deaths prevented	
	N	%	N	%	N	%
Ischaemic heart disease	200	88.4%	25	20.1%	225	64.1%
Ischaemic stroke	5	2.0%	51	41.0%	56	15.8%
Diabetes	20	9.1%	47	37.8%	68	19.3%
Cholelithiasis	1	0.6%	1	1.2%	3	0.8%

Years of life lost

Our years of life lost (YLL) estimates incorporated the impact of deaths at different ages (0–79 years) so that deaths at younger ages resulted in more years of life lost than deaths at older ages. As shown below, since injury deaths occur more often in younger age groups, injuries are responsible for an even larger proportion of alcohol-attributable YLLs than for alcohol-attributable deaths.

The YLL estimates showed a greater disparity between sexes than previously shown for alcohol-attributable deaths, with the alcohol-attributable YLL burden 2.4 times higher in men (n = 9,720) than women (n = 4,049). Most of the leading causes of alcohol-attributable YLLs were similar to the leading causes of alcohol-attributable deaths, as seen in Table 34. Road traffic injuries were responsible for 31.9% of alcohol-attributable YLLs in males (n = 3,103) and 19.7% in females (n = 797). For both males

and females, the proportion of alcohol-attributable burden due to self-inflicted injuries was higher for YLLs than for deaths.

Table 34: Top five causes of alcohol-attributable years of life lost (AA YLLs), by sex (0–79 years; 2007).

Males	% of AA YLLs (N = 9720)	Females	% of AA YLLs (N = 4049)
Road traffic injuries	31.9%	Female breast cancer	23.1%
Self-inflicted injuries	14.4%	Road traffic injuries	19.7%
Other unintentional injuries	10.9%	Alcoholic liver cirrhosis	9.2%
Alcoholic liver cirrhosis	8.0%	Self-inflicted injuries	7.0%
Drownings	4.0%	Haemorrhagic stroke	6.7%

Table 35 shows that injuries accounted for two-thirds of all years of life lost due to alcohol consumption: 73% of male and 42% of female alcohol-attributable years of life lost.

Table 35: Alcohol-attributable YLLs due to cancer, other conditions, and injuries; by sex (0–79 years; 2007).

	Male YLLs		Female YLLs		Total YLLs	
	N	%	N	%	N	%
Cancers	1162	12.0%	1374	33.9%	2536	18.4%
Other conditions	1491	15.3%	968	23.9%	2459	17.9%
Injuries	7066	72.7%	1708	42.2%	8774	63.7%

YLLs prevented due to alcohol consumption are summarised in Table 36 by condition. The YLL proportions are similar to the proportions of deaths prevented by alcohol consumption since most mortality caused by these conditions occurs in older age groups.

Table 36: Male and female YLLs prevented by alcohol consumption, by condition (0–79 years; 2007).

	Male YLLs		Female YLLs		Total YLLs	
	N	%	N	%	N	%
Ischaemic heart disease	1810	89.4%	191	17.9%	2002	64.7%
Ischaemic stroke	29	1.4%	411	38.5%	440	14.2%
Diabetes	174	8.6%	452	42.4%	626	20.2%
Cholelithiasis	12	0.6%	13	1.2%	25	0.8%

MORTALITY BY SEX/ETHNICITY SUBGROUP (2007)

Deaths

The total number of alcohol-attributable deaths in males was approximately double the number of female deaths for both Māori and non-Māori New Zealanders in 2007. The leading causes of alcohol-attributable death were the same for both groups (Table 37). Road traffic injuries were the most common cause of deaths in Māori and non-Māori males, while breast cancer was the most common cause in Māori and non-Māori females.

There are several ethnic differences in ranking order and proportions of causes of alcohol-attributable deaths (see Table 37). However, caution is advised when interpreting these figures due to small numbers in many groups, particularly for Māori. Ischaemic heart disease emerged as the third leading cause of alcohol-attributable deaths in Māori women. This was due to the relatively high proportions of older Māori females who were ex-drinkers (see Appendix E, Table E-6 for detailed consumption data), as female ex-drinkers are approximately 40% more likely to die from ischaemic heart disease compared to female lifetime abstainers (see Table 14 on page 39 for mortality relative risks for ischaemic heart disease). This result differs from all the other sex/ethnicity subgroups, for whom the net effect of alcohol consumption on ischaemic heart disease deaths is estimated to be preventive (see Table 17 and Table 18 on pages 44 and 45 for 2007 ischaemic heart disease mortality AAFs by age/sex/ethnicity subgroup).

Table 37: Top five causes of alcohol-attributable (AA) deaths, by sex and ethnicity (0–79 years; 2007).

Males	% of AA deaths	Females	% of AA deaths
Māori	**(N = 124)**	**Māori**	**(N = 62)**
Road traffic injuries	32.1%	Female breast cancer	19.0%
Other unintentional injuries	13.1%	Road traffic injuries	17.4%
Self-inflicted injuries	10.2%	Ischaemic heart disease	16.3%
Alcoholic liver cirrhosis	5.7%	Alcoholic liver cirrhosis	6.5%
Drownings	5.6%	Haemorrhagic stroke	6.4%
Non-Māori	**(N = 414)**	**Non-Māori**	**(N = 203)**
Road traffic injuries	15.8%	Female breast cancer	29.3%
Alcoholic liver cirrhosis	13.3%	Haemorrhagic stroke	12.2%
Self-inflicted injuries	10.6%	Alcoholic liver cirrhosis	10.8%
Other unintentional injuries	7.6%	Colon cancer	8.5%
Oesophagus cancer	7.4%	Road traffic injuries	7.5%

Māori men had the highest proportion of deaths in 2007 attributed to alcohol consumption (8.3%). In contrast, 5.7% of all deaths in Māori women were attributed to alcohol, while alcohol consumption in non-Māori men and women was responsible for 5.7% and 4.0% of their total annual deaths, respectively (Table 38).

To enable direct comparisons of alcohol-attributable deaths by sex and ethnicity subgroups while controlling for differences in age structure of the populations, we calculated standardised rates of mortality per 100,000 people using the WHO world population[57] as the standard population (see Table 38). The alcohol-attributable death rate for Māori overall was 2.5 times the rate for non-Māori when standardisation had adjusted for the effect of differences in the age structures. In addition to the ethnic disparity in alcohol-attributable deaths, Figure 2 illustrates how men of both ethnic groups had more than double the standardised death rate of women.

Table 38: Alcohol-attributable deaths caused and prevented, by sex and ethnicity (0–79 years; 2007).

	Ethnicity	Deaths caused (count)	% of all deaths	Deaths caused (rate*)	Deaths prevented
Males	Māori	124	8.3%	46.5	28
	Non-Māori	414	5.7%	19.0	198
	Total	537	6.1%	22.7	226
Females	Māori	62	5.7%	22.1	14
	Non-Māori	203	4.0%	8.1	111
	Total	265	4.3%	9.7	125
Total	Māori	185	7.2%	33.8	42
	Non-Māori	617	5.0%	13.5	309
	Total	802	5.4%	16.1	351

* Rate per 100,000 age-standardised to WHO world population

Figure 2: Population standardised alcohol-attributable deaths per 100,000 people, by sex and ethnicity (0–79 years; 2007).

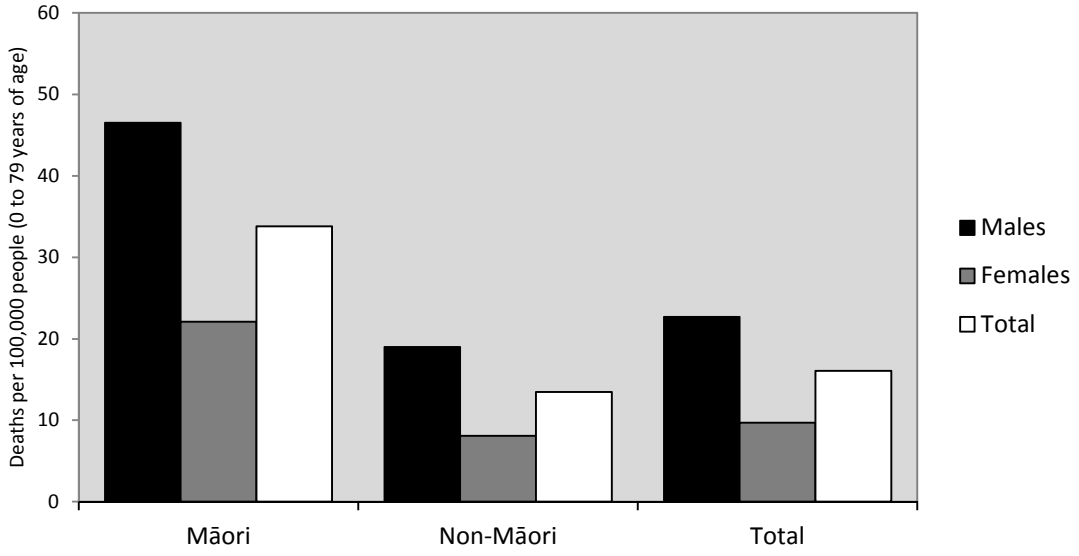


Table 39 shows that sex and ethnic differences in alcohol-attributable deaths were mostly due to injury deaths, whereas the proportions of condition deaths attributable to alcohol consumption did not vary markedly by sex or ethnicity. The results in Table 39 also demonstrate the substantial contribution of alcohol consumption to injury deaths in both sexes and ethnicities, with estimates of alcohol-attributable

injury deaths as a proportion of all injury deaths ranging from 14% in non-Māori females to 36% in Māori males.

Table 39: Alcohol-attributable (AA) condition and injury deaths, by sex and ethnicity (0–79 years; 2007).

	Ethnicity	Conditions: AA deaths caused	% of total condition deaths	Injuries: AA deaths caused	% of total injury deaths
Males	Māori	34	2.8%	89	35.8%
	Non-Māori	223	3.4%	191	24.2%
	Total	258	3.3%	280	27.0%
Females	Māori	39	4.0%	23	22.7%
	Non-Māori	160	3.4%	43	14.2%
	Total	199	3.5%	66	16.3%
Total	Māori	73	3.3%	112	32.0%
	Non-Māori	383	3.4%	234	21.4%
	Total	456	3.4%	346	24.0%

Table 40 provides the estimated alcohol-attributable death numbers for 2007 by sex/ethnicity subgroup, showing the differences within each specific condition and injury category.

Table 40: Number of alcohol-attributable deaths for each condition and injury category, by sex and ethnicity (0–79 years; 2007).*

	Māori			Non-Māori			Total		
	Males	Females	All	Males	Females	All	Males	Females	All
Conditions									
Mouth and oropharyngeal cancers	4	0	4	27	6	33	31	7	38
Oesophagus cancer	3	0	3	31	5	36	34	5	39
Colon cancer	1	2	2	15	17	33	16	19	35
Rectum cancer	2	0	3	16	8	24	18	9	26
Liver cancer	5	1	6	15	4	19	20	5	25
Laryngeal cancer	1	0	2	5	1	6	7	1	8
Female breast cancer		12	12		60	60		71	71
Alcohol use disorders	0	2	2	11	4	15	11	6	17
Epilepsy	1	0	1	7	3	10	8	3	11
Hypertensive heart disease	2	0	2	9	1	9	11	0	11
Ischaemic heart disease†	-24	10	-14	-176	-25	-201	-200	-15	-215
Cardiac arrhythmias	1	0	1	1	1	2	2	1	3
Ischaemic stroke†	1	-4	-3	-5	-47	-52	-3	-51	-55
Haemorrhagic stroke	4	4	8	25	25	50	29	29	58
Oesophageal varices	0	0	0	1	0	1	1	0	1
Alcoholic liver cirrhosis	7	4	11	55	22	77	62	26	88
Cholelithiasis	0	0	0	-1	-1	-2	-1	-1	-3
Pancreatitis	0	0	1	1	1	2	2	1	3
Low birth weight	1	1	1	1	0	1	1	1	3
Fetal alcohol syndrome	0	0	0	0	0	0	0	0	0
Tuberculosis	0	0	0	1	0	1	1	1	2
Lower resp. infections: pneumonia	1	1	2	3	2	5	4	3	6
Diabetes mellitus	-4	-10	-14	-17	-37	-54	-20	-47	-68
Injuries									
Road traffic injuries	40	11	50	65	15	81	105	26	131
Alcohol poisonings	1	1	2	8	0	8	9	1	10
Non-alcohol poisonings	5	2	6	10	4	14	14	6	20
Falls	3	1	4	12	4	15	15	4	19
Fires	1	0	1	2	0	3	3	1	4
Drownings	7	1	8	11	1	12	18	2	20
Other unintentional injuries	16	2	18	32	6	38	48	8	56
Self-inflicted injuries	13	3	15	44	9	53	56	12	68
Assault	4	3	7	7	4	11	11	7	18
Other intentional injuries	0	0	0	1	0	1	1	0	1

* Totals may not exactly equal the sums of components. This is a result of the table estimates being rounded to the nearest whole number, while totals are calculated from actual estimates with several decimal places.
† For ischaemic heart disease and ischaemic stroke, please note that totals are *net* deaths due to several instances where totals combine positive and negative numbers of deaths. Please see Appendix H for detailed alcohol-attributable death numbers for each age/sex/ethnicity subgroup.

Years of life lost

For both Māori and non-Māori, alcohol-attributable injuries contributed a larger proportion of alcohol-attributable YLLs than alcohol-attributable deaths (Table 41). This is due to the lower average age of death for injuries than for most other conditions.

Table 41: Top five causes of alcohol-attributable years of life lost (AA YLLs), by sex and ethnicity (0–79 years; 2007).

Males	% of AA YLLs	Females	% of AA YLLs
Māori	**(N = 2888)**	**Māori**	**(N = 1165)**
Road traffic injuries	41.1%	Road traffic injuries	29.6%
Other unintentional injuries	14.2%	Female breast cancer	14.2%
Self-inflicted injuries	12.3%	Ischaemic heart disease	7.2%
Drownings	5.1%	Violence	7.1%
Non-alcohol poisonings	4.4%	Self-inflicted injuries	6.4%
Non-Māori	**(N = 6831)**	**Non-Māori**	**(N = 2885)**
Road traffic injuries	28.1%	Female breast cancer	26.7%
Self-inflicted injuries	15.3%	Road traffic injuries	15.7%
Alcoholic liver cirrhosis	9.9%	Alcoholic liver cirrhosis	10.8%
Other unintentional injuries	9.5%	Haemorrhagic stroke	7.5%
Oesophagus cancer	3.9%	Self-inflicted injuries	7.2%

Table 42 shows that the alcohol-attributable YLL rate for Māori overall was 2.6 times the non-Māori rate when the differences in age structure had been adjusted for. This was similar to the magnitude of ethnic disparity estimated for the standardised death rates. Sex differences were also present in standardised YLL rates, with the rate of alcohol-attributable YLLs in Māori and non-Māori men 2.6 and 2.7 times the corresponding female YLL rates, respectively (Table 42). These sex differences in YLL rates were larger than those estimated for alcohol-attributable death rates.

Table 42: Alcohol-attributable years of life lost (YLLs) caused and prevented, by sex and ethnicity (0–79 years; 2007).

	Ethnicity	YLLs caused (count)	YLLs caused (rate)**	YLLs prevented
Males	Māori	2888	1013	317
	Non-Māori	6831	382	1708
	Total	9720	478	2025
Females	Māori	1165	389	166
	Non-Māori	2885	140	903
	Total	4049	177	1069
Total	Māori	4053	688	483
	Non-Māori	9716	260	2611
	Total	13769	325	3095

*We were unable to calculate the proportions of all YLLs that were attributable to alcohol because GBD YLL denominator data was not available for 2007.

**Rate per 100,000 age-standardised to WHO world population.

MORTALITY BY AGE/SEX SUBGROUP (2007)

Deaths

Table 43 shows how the leading causes of alcohol-attributable deaths differed by age for male and female New Zealanders. Injuries were the dominant cause of alcohol-attributable deaths in young adults, with only injury categories included in the five leading causes of alcohol-attributable deaths in 15–29 year old males, 30–44 year old males, and 15–29 year old females. For these three young adult subgroups, road traffic injuries and self-inflicted injuries were the first and second specific leading causes of alcohol-attributable deaths, with road traffic injuries responsible for more than half of the alcohol-attributable deaths in 15–29 year old males (n = 58) and females (n = 14) and almost one-third of alcohol-attributable deaths in 30–44 year old males (n = 33). Breast cancer was a leading cause of alcohol-attributable deaths in women over 30 years old, while alcoholic liver cirrhosis was a common cause of alcohol-attributable deaths in women older than 30 years and men older than 45 years.

Table 44 details the how the numbers of alcohol-attributable deaths caused by injuries and conditions varied by age and sex. Injuries were responsible for most alcohol-attributable deaths in young adults, with a transition in the older age groups to fewer alcohol-attributed injury deaths and more deaths due to alcohol-attributable conditions. This transition from alcohol-attributable injury deaths to condition deaths was more apparent and appeared later in life for men than women (Figure 3).

Table 43: Top five causes of alcohol-attributable (AA) deaths, by age and sex (2007).*

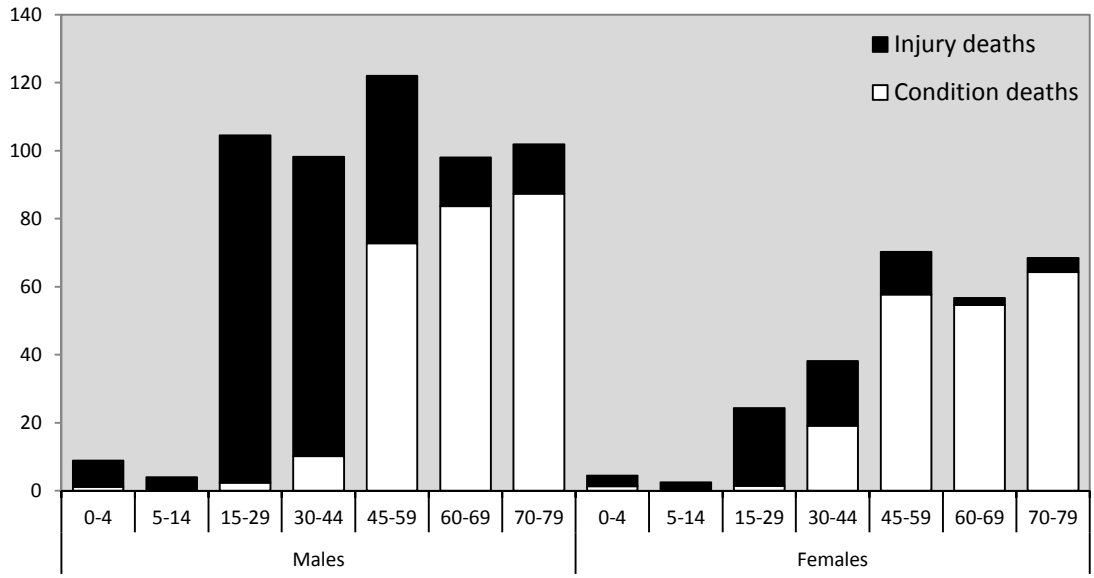
Males	% of AA deaths	Females	% of AA deaths
15-29 years	**(N = 104)**	**15-29 years**	**(N = 24)**
Road traffic injuries	55.9%	Road traffic injuries	58.0%
Self-inflicted injuries	17.8%	Self-inflicted injuries	13.8%
Non-alcohol poisonings	6.0%	Violence	9.6%
Other unintentional injuries	5.6%	Other unintentional injuries	6.0%
Violence	4.6%	Non-alcohol poisonings	4.9%
30-44 years	**(N = 98)**	**30-44 years**	**(N = 38)**
Road traffic injuries	33.9%	Female breast cancer	22.8%
Self-inflicted injuries	22.8%	Road traffic injuries	15.4%
Other unintentional injuries	15.7%	Alcoholic liver cirrhosis	13.1%
Non-alcohol poisonings	5.2%	Self-inflicted injuries	12.1%
Drownings	4.1%	Haemorrhagic stroke	6.2%
45-59 years	**(N = 122)**	**45-59 years**	**(N = 70)**
Alcoholic liver cirrhosis	24.6%	Female breast cancer	38.8%
Other unintentional injuries	9.9%	Alcoholic liver cirrhosis	12.8%
Self-inflicted injuries	9.3%	Haemorrhagic stroke	8.2%
Mouth and oropharyngeal cancers	6.1%	Alcohol use disorders	4.3%
Liver cancer	6.0%	Self-inflicted injuries	4.2%
60-69 years	**(N = 98)**	**60-69 years**	**(N = 57)**
Alcoholic liver cirrhosis	22.5%	Female breast cancer	32.8%
Mouth and oropharyngeal cancers	12.6%	Alcoholic liver cirrhosis	19.4%
Oesophagus cancer	11.8%	Colon cancer	10.9%
Rectum cancer	7.1%	Haemorrhagic stroke	8.8%
Haemorrhagic stroke	6.7%	Rectum cancer	4.5%
70-79 years	**(N = 102)**	**70-79 years**	**(N = 68)**
Haemorrhagic stroke	15.4%	Female breast cancer	23.8%
Oesophagus cancer	14.4%	Haemorrhagic stroke	22.7%
Alcoholic liver cirrhosis	6.9%	Colon cancer	13.9%
Colon cancer	7.6%	Ischaemic heart disease	9.7%
Rectum cancer	7.2%	Rectum cancer	4.8%

* There were too few alcohol-attributable deaths in male and female children (014 years) to rank by proportions.

Table 44: Alcohol-attributable (AA) condition and injury deaths, by age and sex (2007).

	Age category (years)	AA deaths caused	% of total deaths	Conditions: AA deaths caused	Injuries: AA deaths caused
Males	0-4	9	4.1%	1	8
	5-14	4	7.9%	0	4
	15-29	104	26.6%	2	102
	30-44	98	16.2%	10	88
	45-59	122	7.4%	73	49
	60-69	98	4.6%	84	14
	70-79	102	2.7%	87	14
	Total	**537**	**6.1%**	**258**	**280**
Females	0-4	4	2.5%	1	3
	5-14	2	5.9%	0	2
	15-29	24	14.8%	1	23
	30-44	38	8.9%	19	19
	45-59	70	6.3%	58	12
	60-69	57	3.8%	55	2
	70-79	68	2.5%	64	4
	Total	**265**	**4.3%**	**199**	**66**

Figure 3: Number of condition and injury deaths attributable to alcohol consumption, by age and sex (2007).



We further examined the composition of the alcohol-attributable death burden by broad injury and condition categories in adult males (figure 4) and females (Figure 5). These figures highlight the prominent role of injuries in the youngest age groups (i.e. 98% and 94% of alcohol-attributable deaths in

15–29 year old males and females, respectively) and the increasing role of cancers and cardiovascular disorders with age. For detailed lists of the specific conditions and injuries included within each broad cause category, please see Table 3 on page 13 (conditions) and Table 6 on page 17 (injuries).

Figure 4: Males: Causes of alcohol-attributable deaths, by age (2007).

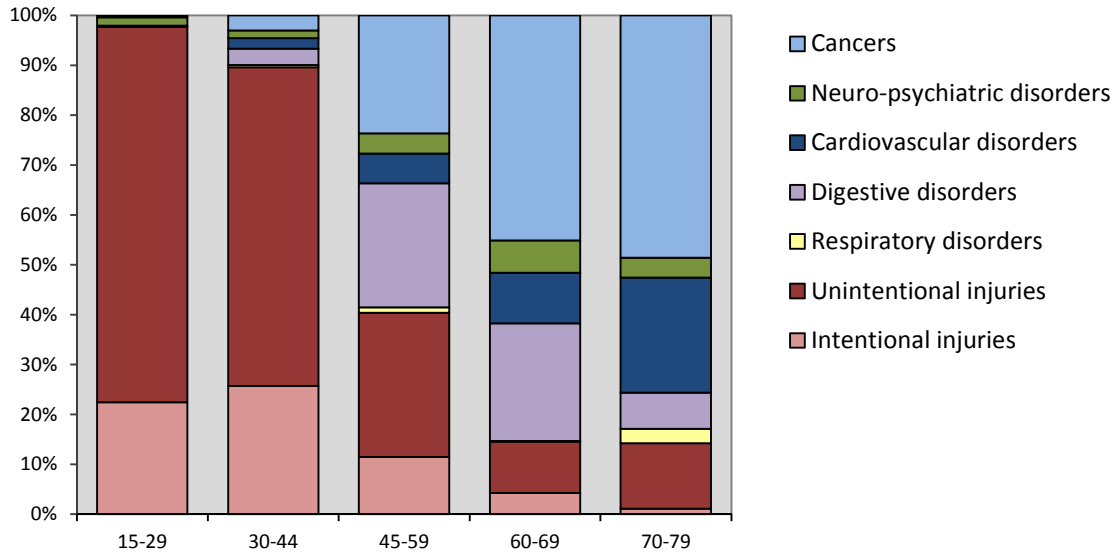
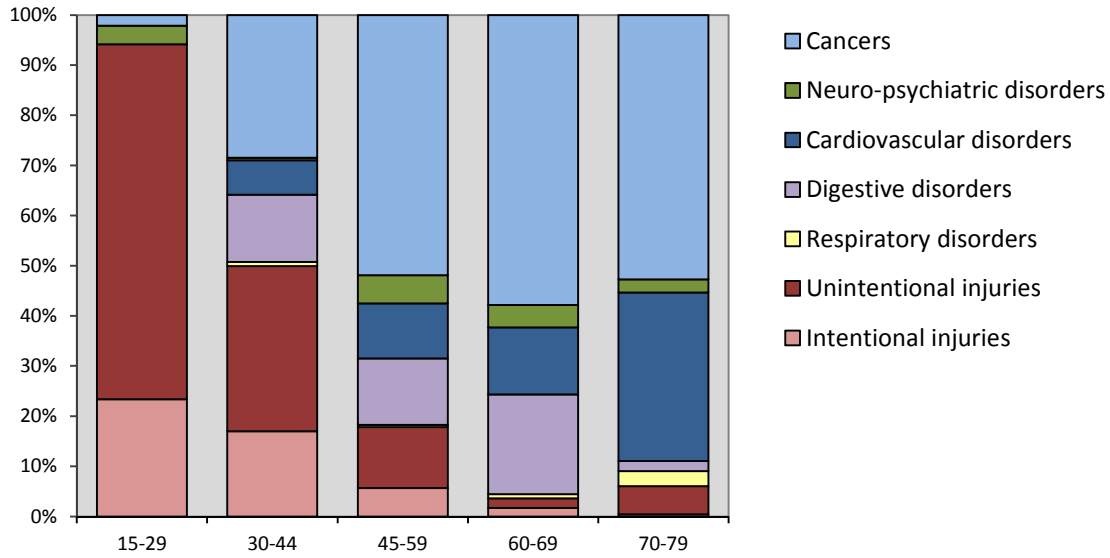


Figure 5: Females: Causes of alcohol-attributable deaths, by age (2007).



MORTALITY BY AGE/ETHNICITY SUBGROUP (2007)

Deaths

The absolute numbers of Māori and non-Māori deaths caused and prevented by alcohol consumption are presented by age category in

Figure 6 and Figure 7. The largest number of alcohol-attributed Māori deaths occurred in young to middle-aged adults with fewer deaths in older age categories, whereas for non-Māori the number of alcohol-attributed deaths increased with increasing age. For both Māori and non-Māori, most deaths prevented by alcohol consumption would have occurred in people 45 years and older.

The Māori and non-Māori populations have different age structures, with relatively larger proportions of younger Māori and older non-Māori (i.e. in 2007, 60% of the Māori population and 39% of the non-Māori population was aged 0–29 years, while 6% of Māori and 15% of non-Māori were 60–79 years old). These contrasting age structures are reflected in the larger number of absolute deaths caused and prevented within younger age categories for Māori (

Figure 6) and older age categories for non-Māori (Figure 7).

When the impact of the age structures on the alcohol-attributable death burden is adjusted for by calculating age/ethnicity-specific rates (i.e. dividing death numbers by the population size of each age/ethnicity subgroup), the Māori alcohol-attributable death rates are more than double the corresponding non-Māori death rates for most age groups (1.9 times greater in 60–69 year old Māori; see Table 45).

Figure 6: Number of Māori deaths caused and prevented by alcohol consumption, by age (2007).

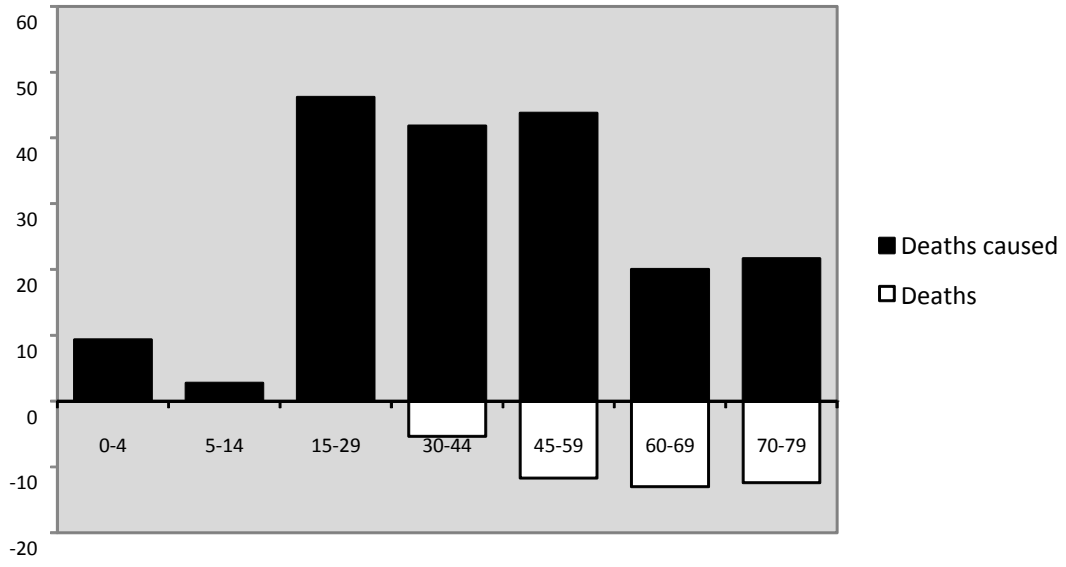


Figure 7: Number of non-Māori deaths caused and prevented by alcohol consumption, by age (2007).

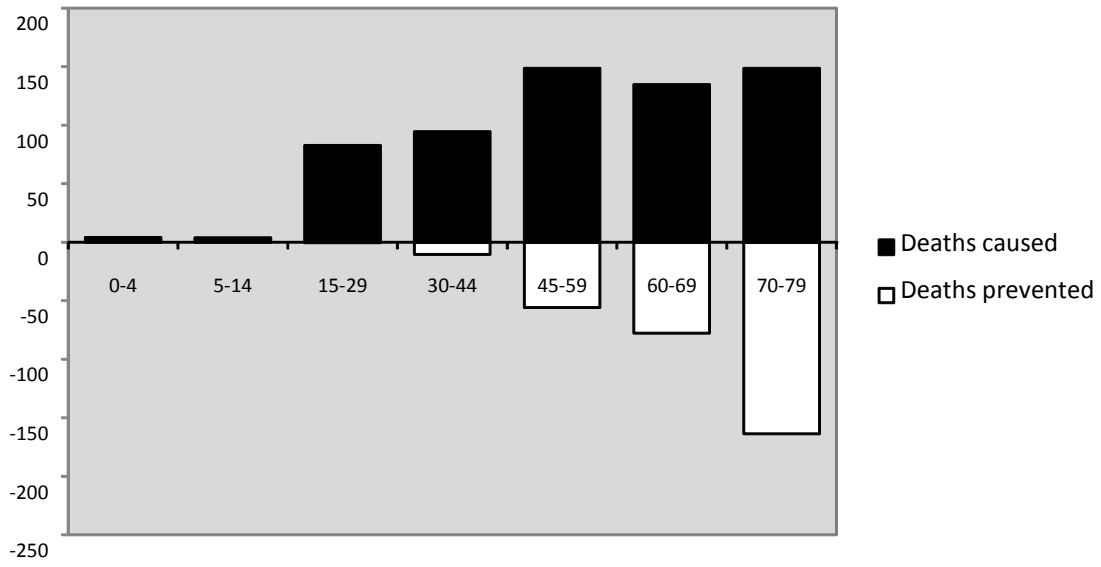


Table 45: Māori and non-Māori alcohol-attributable death rates, by age (2007).

	0-4	5-14	15-29	30-44	45-59	60-69	70-79
Deaths caused (rate*)							
Māori	12	2	29	33	51	75	179
Non-Māori	2	1	12	12	20	40	69
Deaths prevented (rate*)							
Māori	0	0	0	-4	-14	-49	-103
Non-Māori	0	0	0	-1	-8	-23	-76

* Death rates per 100,000 using 2007 population numbers for each age/ethnicity subgroup as denominators.

Years of life lost

The impact of deaths at different ages was taken into account by calculating the alcohol-attributable years of life lost (YLLs) by age/ethnicity subgroup. For both Māori (

Figure 8) and non-Māori (Figure 9), a higher proportion of the overall YLL burden was due to deaths in younger age groups. Due to the older age structure of the non-Māori population, the pattern of alcohol-attributable YLLs by age group was different from that seen for alcohol-attributable deaths (Figure 7), with a decreasing contribution to the YLL burden with increasing age.

Figure 8: Number of Māori YLLs caused and prevented by alcohol consumption, by age (2007).

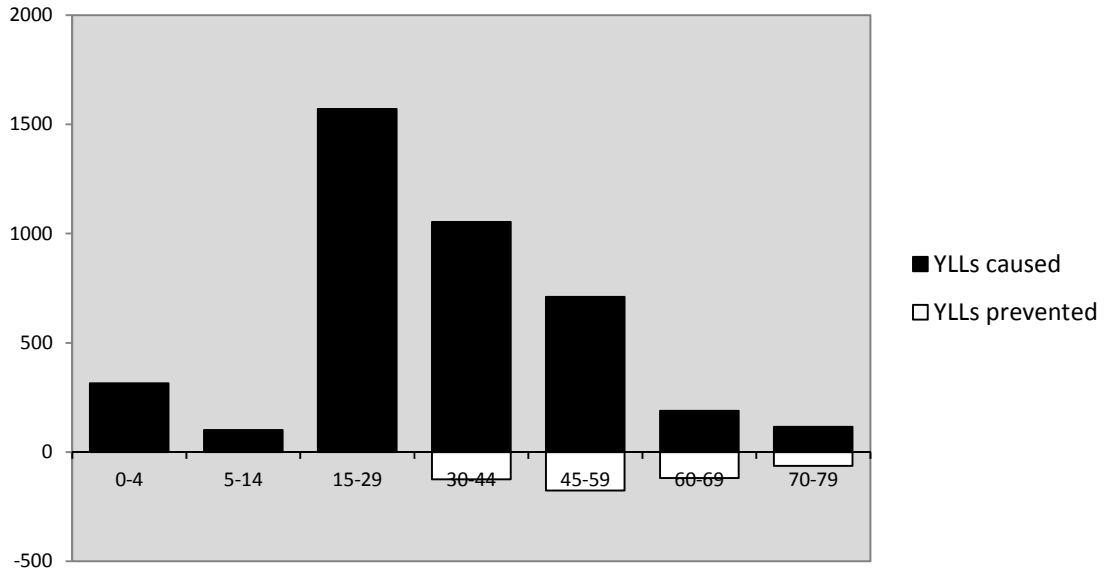
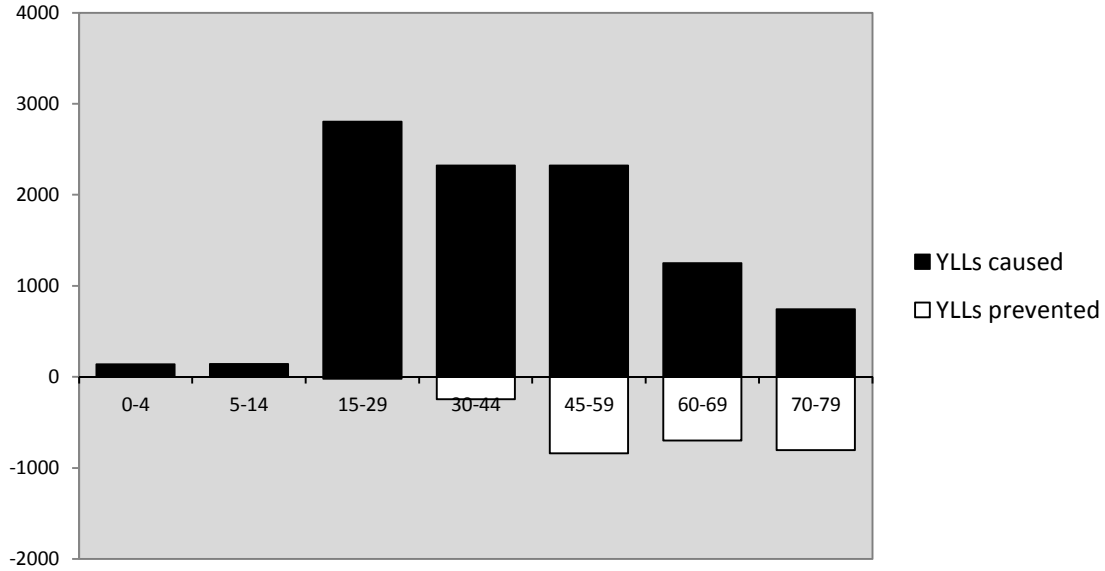


Figure 9: Number of non-Māori YLLs caused and prevented by alcohol consumption, by age (2007).



MORTALITY BY AGE/SEX/ETHNICITY SUBGROUP (2007)

The absolute numbers of alcohol-attributable deaths and YLLs are presented in Table 46 by age/sex/ethnicity subgroup.

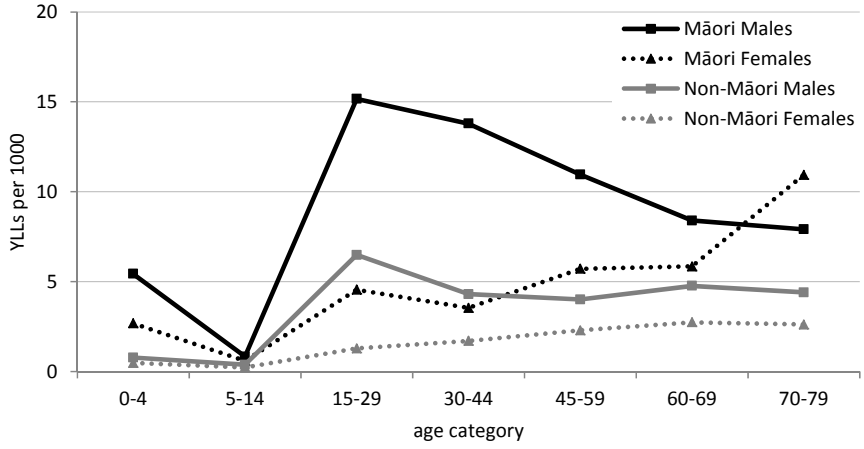
Table 46: Number of alcohol-attributable deaths and years of life lost (YLLs); by age, sex and ethnicity (2007).

	Ethnicity	0-4	5-14	15-29	30-44	45-59	60-69	70-79
Males	Māori	6 (214)	2 (60)	35 (1196)	32 (816)	27 (452)	12 (107)	9 (43)
	Non-Māori	3 (86)	2 (89)	69 (2343)	66 (1625)	94 (1460)	86 (782)	93 (445)
	Totals	9 (300)	4 (149)	104 (3539)	98 (2441)	122 (1912)	98 (889)	102 (489)
Females	Māori	3 (100)	1 (41)	11 (374)	9 (237)	16 (259)	8 (81)	13 (72)
	Non-Māori	1 (51)	1 (52)	13 (460)	29 (696)	54 (861)	49 (466)	55 (298)
	Total	4 (151)	2 (93)	24 (834)	38 (933)	70 (1120)	57 (548)	68 (370)
Total	Māori	9 (314)	3 (101)	46 (1570)	42 (1053)	44 (711)	20 (189)	22 (115)
	Non-Māori	4 (137)	4 (142)	83 (2804)	95 (2321)	148 (2321)	135 (1248)	149 (743)
	Total	13 (451)	6 (242)	129 (4374)	136 (3374)	192 (3032)	155 (1437)	170 (859)

Figure 10 shows the numbers of YLLs attributed to alcohol per 1,000 people for each age/sex/ethnicity subgroup. The age-specific rates of Māori YLLs lost were more than 1.8 times the corresponding non-Māori rates for every age group. Compared to the other sex/ethnicity subgroups, Māori males lost the most years of life per 1,000 people due to alcohol consumption for almost all age categories. This contrast was particularly marked in the youngest adult age group, with the YLL rate of 15–29 year old Māori males 2.3, 3.3 and 11.7 times higher than 15–29 year old non-Māori males, Māori females, and non-Māori females, respectively.

Further details of 2007 Māori and non-Māori alcohol-attributable mortality by age/sex subgroup and cause of death are provided in Appendix H (Table H-3 and Table H-4).

Figure 10: Age-specific rates of years of life lost due to alcohol consumption, by sex and ethnicity (2007).



2004 MORTALITY RESULTS (BRIEF SUMMARY)

OVERVIEW

This section presents a brief summary of the alcohol-attributable deaths and years of life lost (YLL) in New Zealand during 2004. These mortality estimates are for New Zealanders aged 0–79 years, and further details (comparable with 2007 mortality tables and figures) are provided in Appendix I.

Overall, 787 deaths in New Zealanders aged 0–79 years were attributed to alcohol consumption in 2004, representing 5.1% of all deaths under 80 years old. These deaths represented 13,605 YLLs attributable to alcohol (8.0% of all YLLs: 9.6% of all male YLLs and 5.8% of all female YLLs). Alcohol consumption was also estimated to prevent 405 deaths but only 3,433 YLLs. This was because the preventive effects were confined to conditions in older adults, while many deaths caused by alcohol occur in young people.

The following tables and figures show the 2004 mortality results are similar to the 2007 mortality results presented in the previous section. More ischaemic heart disease deaths were estimated to be prevented (269 deaths) in 2004 than in 2007 (225 deaths) due to alcohol consumption. However, this difference was mostly due to more ischaemic heart disease deaths occurring in non-Māori men and women during 2004 compared to 2007, rather than changes in alcohol consumption between years.

Deaths

For New Zealanders aged 0–79 years, the number of male deaths due to alcohol consumption (n = 521) was double the number of deaths in women (n = 265). Table 47 shows how the top five causes of alcohol-attributable deaths differed for male and female New Zealanders. Road traffic injuries were the most common cause of alcohol-attributable deaths (n = 106) in men, while alcohol-attributable breast cancer deaths (n = 67) were the leading cause of death due to alcohol consumption in women. Alcoholic liver cirrhosis and haemorrhagic stroke were among the most common causes of alcohol-attributable death for both sexes.

Table 48 shows how injuries (including unintentional and intentional) were responsible for more than half of alcohol-attributable deaths in male New Zealanders, and most of the difference between males and females.

Table 47: Top five causes of alcohol-attributable (AA) deaths, by sex (0–79 years; 2004).

Males	% of AA deaths (N = 521)	Females	% of AA deaths (N = 265)
Road traffic injuries	20.3%	Female breast cancer	25.1%
Self-inflicted injuries	11.0%	Haemorrhagic stroke	12.0%
Alcoholic liver cirrhosis	10.7%	Road traffic injuries	10.5%
Other unintentional injuries	7.8%	Alcoholic liver cirrhosis	9.0%
Haemorrhagic stroke	6.0%	Colon cancer	6.6%

Table 48: Alcohol-attributable deaths due to cancer, other conditions, and injuries; by sex (0–79 years; 2004).

	Male deaths		Female deaths		Total deaths	
	N	%	N	%	N	%
Cancers	109	20.9%	110	41.3%	218	27.8%
Other conditions	143	27.4%	89	33.4%	231	29.4%
Injuries	270	51.8%	67	25.3%	337	42.8%

The numbers of deaths estimated to be prevented by low average volumes of alcohol consumption in New Zealand are shown in Table 49. Of all male deaths prevented by drinking (n = 259), more than 90% were due to alcohol drinking reducing the risk of ischaemic heart disease, while the deaths prevented by female drinking (n = 145) were more evenly distributed between ischaemic heart disease, ischaemic stroke, and diabetes.

Table 49: Male and female deaths prevented by alcohol consumption, by condition (0–79 years; 2004).

	Male deaths prevented		Female deaths prevented		Total deaths prevented	
	N	%	N	%	N	%
Ischaemic heart disease	233	89.9%	36	24.8%	269	66.5%
Ischaemic stroke	5	2.0%	59	40.6%	64	15.8%
Diabetes	20	7.6%	48	33.2%	68	16.7%
Cholelithiasis	1	0.6%	2	1.5%	4	0.9%

Table 50 shows how the leading causes of alcohol-attributable deaths differed by age for male and female New Zealanders. Injuries were the dominant cause of alcohol-attributable deaths in young adults, with only injury categories included in the five leading causes of alcohol-attributable deaths in 15–29 year old males, 30–44 year old males, and 15–29 year old females. For these three young adult subgroups, road traffic injuries and self-inflicted injuries were the first and second specific leading causes of alcohol-attributable deaths, with road traffic injuries responsible for more than half of the alcohol-attributable deaths in 15–29 year old males (n = 60) and females (n = 14) and almost one-third of alcohol-attributable deaths in 30–44 year old males (n = 31). Breast cancer was a leading cause of alcohol-attributable deaths in women over 30 years old, while alcoholic liver cirrhosis was a common cause of alcohol-attributable deaths in women older than 30 years and men older than 45 years.

Table 50: Top five causes of alcohol-attributable (AA) deaths, by age and sex (2004).*

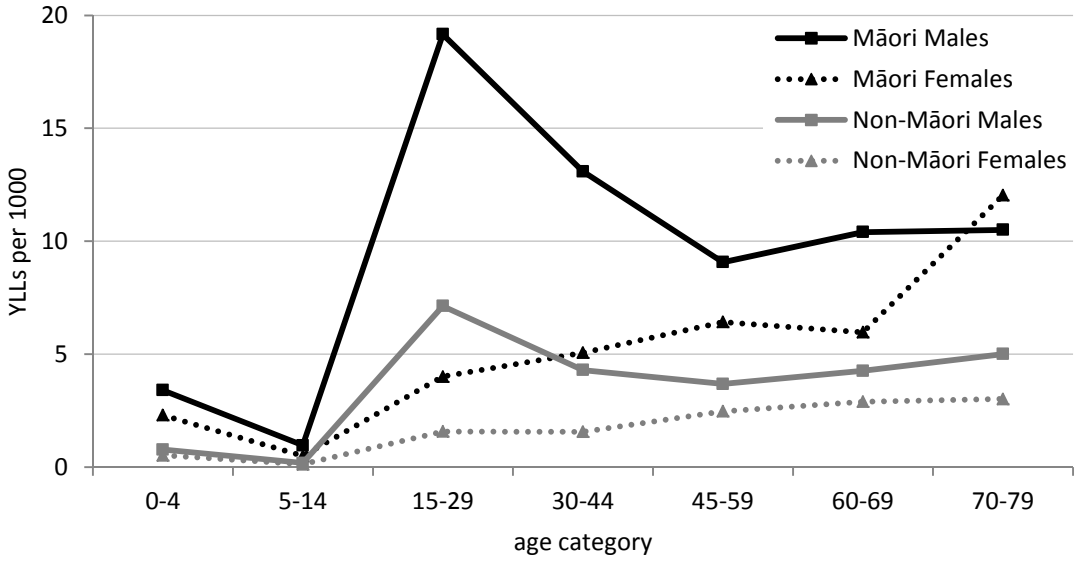
Males	% of AA deaths	Females	% of AA deaths
15-29 years	**(N = 115)**	**15-29 years**	**(N = 25)**
Road traffic injuries	52.1%	Road traffic injuries	57.0%
Self-inflicted injuries	19.8%	Self-inflicted injuries	16.9%
Other unintentional injuries	6.0%	Non-alcohol poisonings	6.5%
Non-alcohol poisonings	4.4%	Alcohol poisonings	4.1%
Drownings	4.2%	Other unintentional injuries	3.8%
30-44 years	**(N = 100)**	**30-44 years**	**(N = 39)**
Road traffic injuries	31.3%	Female breast cancer	25.9%
Self-inflicted injuries	20.6%	Road traffic injuries	23.8%
Other unintentional injuries	13.0%	Alcoholic liver cirrhosis	10.2%
Drownings	5.6%	Self-inflicted injuries	9.7%
Falls	4.6%	Alcohol use disorders	5.1%
45-59 years	**(N = 102)**	**45-59 years**	**(N = 69)**
Alcoholic liver cirrhosis	16.6%	Female breast cancer	32.7%
Mouth and oropharyngeal cancers	9.6%	Alcoholic liver cirrhosis	15.9%
Other unintentional injuries	9.4%	Alcohol use disorders	8.7%
Self-inflicted injuries	9.1%	Haemorrhagic stroke	7.4%
Road traffic injuries	8.3%	Colon cancer	4.8%
60-69 years	**(N = 83)**	**60-69 years**	**(N = 52)**
Alcoholic liver cirrhosis	27.7%	Female breast cancer	34.6%
Oesophagus cancer	12.2%	Haemorrhagic stroke	13.0%
Mouth and oropharyngeal cancers	11.0%	Colon cancer	10.4%
Haemorrhagic stroke	6.5%	Alcoholic liver cirrhosis	7.7%
Rectum cancer	6.2%	Rectum cancer	6.2%
70-79 years	**(N = 112)**	**70-79 years**	**(N = 75)**
Haemorrhagic stroke	17.0%	Haemorrhagic stroke	25.0%
Alcohol use disorders	10.7%	Female breast cancer	20.3%
Alcoholic liver cirrhosis	10.7%	Colon cancer	11.3%
Oesophagus cancer	8.4%	Ischaemic heart disease	8.3%
Mouth and oropharyngeal cancers	7.4%	Alcoholic liver cirrhosis	6.7%

* There were too few alcohol-attributable deaths in male and female children (0–14 years) to rank by proportions.

Years of LIFE LOST Figure 11 shows the numbers of YLLs attributed to alcohol per 1,000 people for each age/sex/ethnicity subgroup. The age-specific rates of Māori YLLs lost were more than double the corresponding non-Māori rates for every age group. Compared to the other sex/ethnicity subgroups, Māori males lost the most years of life per 1,000 people due to alcohol consumption for almost all age categories. This contrast was particularly marked in the youngest adult age group, with the YLL rate of 15–29 year old Māori males 2.7, 4.8 and 12.1 times higher than 15–29 year old non-Māori males, Māori females and non-Māori females, respectively.

Further details of Māori and non-Māori mortality by age/sex subgroup and cause of death are provided Appendix H.

Figure 11: Age-specific rates of years of life lost due to alcohol consumption, by sex and ethnicity (2004).



2004 DISABILITY-ADJUSTED LIFE YEARS (DALYS) RESULTS

OVERVIEW

This section presents our alcohol-attributable disability-adjusted life year (DALY) estimates for New Zealand during 2004, the most recent year for which the required data were available from the WHO Global Burden of Disease study. As described previously in the 'Methods: Alcohol-attributable DALYs (2004) ' section (starting on page 49), alcohol-attributable DALYs combined mortality and morbidity due to alcohol consumption by adding the years of life lost due to premature death (YLLs) and the years of 'healthy' life lost due to disability (YLDs). One DALY indicates the loss of one year of full health,[47] making it possible to express alcohol-attributable mortality and morbidity in the same units (years of life). The use of DALYs as a more comprehensive measure of population health burden allows for analyses that include health consequences that result in early deaths but little disability (e.g.) drownings) alongside those that often result in disability but rarely cause deaths (e.g) alcohol use disorders).

Alcohol-attributable DALY estimates are reported by:

- Sex (see page 89)
- Age/sex (see page 96)
- Unipolar depressive disorders: Sensitivity analysis (see page 100).

We were unable to calculate the alcohol-attributable DALY burden for Māori and non-Māori separately, since ethnicity-specific WHO Global Burden of Disease (GBD) study estimates for YLDs were not available.

Since only GBD condition and injury categories could be used for DALY calculations, there were several differences from the categories used in our alcohol-attributable mortality analysis (see 'Differences in alcohol-attributable condition and injury categories between mortality and DALY analyses' starting on page 50 for details). The categories that were excluded from our DALY analysis due to the absence of corresponding GBD categories were: laryngeal cancer, cardiac arrhythmias, oesophageal varices, cholelithiasis, pancreatitis, and fetal alcohol syndrome.

Overall, 28,403 disability-adjusted life years in New Zealanders aged 0–79 years were attributed to alcohol consumption in 2004, representing 6.5% of all DALYs lost. The total of 6,538 DALYs were estimated to be prevented by alcohol consumption in New Zealanders under 80 years old.

DALYS BY SEX (2004)

When DALYs were used to measure the alcohol-attributable disease and injury burden for New Zealanders aged 0–79 years, the burden in men was double that in women, while the number of DALYs considered prevented by alcohol was almost the same (Table 51).

Table 51: Alcohol-attributable disability-adjusted life years (AA DALYs) lost and prevented, by sex (0–79 years; 2004).

	AA DALYs lost (count)	% of all DALYs lost	AA DALYs lost (rate*)	AA DALYs prevented
Males	18,803	8.8%	933	3,482
Females	9,601	4.3%	435	3,057
Total	28,403	6.5%	680	6,538

* Rate per 100,000 age-standardised to WHO world population

While several of the leading causes of alcohol-attributable DALYs were also top causes of alcohol-attributable deaths in males (i.e. road traffic injuries, self-inflicted injuries, and other unintentional injuries) and females (i.e. breast cancer, road traffic injuries, and liver cirrhosis), alcohol use disorders clearly emerged as the leading cause of alcohol-attributable DALYs for both sexes (Table 52). In males, alcohol use disorders were responsible for more than twice the proportion of DALYs lost than alcohol-attributable road traffic injuries. The relative contribution of alcohol use disorders to the overall alcohol-attributable DALY burden was even greater in women, with the number of DALYs due to alcohol use disorders more than four times the DALYs due to alcohol-attributable breast cancer or road traffic injuries.

This major difference between our mortality and DALY results is partly due to differences in case-fatality and duration of conditions, but mainly because the specific cause of death for people with alcohol use disorders usually belongs to another category.

Table 52: Top five causes of alcohol-attributable disability-adjusted life years (AA DALYs) lost, by sex (0–79 years; 2004).

Males	% of AA DALYs (N = 18803)	Females	% of AA DALYs (N = 9601)
Alcohol use disorders	42.5%	Alcohol use disorders	50.0%
Road traffic injuries	18.8%	Female breast cancer	12.2%
Self-inflicted injuries	7.8%	Road traffic injuries	10.3%
Other unintentional injuries	6.5%	Cirrhosis of the liver	4.3%
Cirrhosis of the liver	3.8%	Other unintentional injuries	3.5%

Table 53 shows how using DALYs instead of mortality to measure the alcohol-attributable burden changed the distribution of burden between major cause categories. A large proportion of the non-fatal burden of alcohol is suffered by those living with heavy drinking (i.e. alcohol use disorders) rather than suffering from a specific disease or injury.

Table 53: Alcohol-attributable DALYs lost due to cancer, other conditions, and injuries, by sex (0–79 years; 2004).

	Males		Females		Total	
	DALYs	%	DALYs	%	DALYs	%
Cancers	1114	5.9%	1680	17.5%	2793	9.8%
Other conditions	9717	51.7%	5811	60.5%	15528	54.7%
Injuries	7972	42.4%	2109	22.0%	10081	35.5%

The numbers of DALYs estimated as prevented by alcohol consumption in New Zealand are shown in Table 54. The distribution of male DALYs prevented was similar to the distribution of prevented deaths and YLLs. More differences between alcohol-attributable DALYs and deaths/YLLs prevented were seen for female New Zealanders, with ischaemic stroke accounting for a smaller proportion and diabetes mellitus responsible for a larger proportion of DALYs prevented, reflecting the long average duration of diabetes compared with non-fatal stroke. DALYs prevented due to cholelithiasis could not be included in this analysis since cholelithiasis is not a GBD cause category, so YLD estimates were not available.

While haemorrhagic stroke was responsible for alcohol-attributable mortality, it appeared as a source of female DALYs prevented by alcohol consumption (Table 54). This seemingly paradoxical result occurred because, for women, morbidity AAFs were estimated as preventive for all age categories (see Table 29 on page 62 for morbidity AAFs), based on preventive morbidity relative risks (i.e. RR < 1.0) for female drinkers with average daily alcohol consumptions of less than 40 grams of alcohol (see Table 26 on page 59 for morbidity RR estimates). The majority of New Zealand females fell into this alcohol consumption category for all age categories. However, when these YLDs prevented were combined with YLLs caused, the net number of DALYs prevented was very small.

Table 54: Male and female DALYs prevented by alcohol consumption, by condition (0–79 years; 2004).

	Males		Females		Total	
	DALYs	%	DALYs	%	DALYs	%
Ischaemic heart disease	3078	88.4%	884	28.9%	3962	60.6%
Ischaemic stroke	77	2.2%	741	24.2%	817	12.5%
Haemorrhagic stroke	0	0.0%	146	4.8%	146	2.2%
Hypertensive heart disease	0	0.0%	1	0.0%	1	0.0%
Diabetes mellitus	327	9.4%	1286	42.1%	1612	24.7%

As previously mentioned, several categories were excluded from our DALY analysis due to the absence of corresponding GBD categories (i.e. laryngeal cancer, cardiac arrhythmias, oesophageal varices, cholelithiasis, pancreatitis, and fetal alcohol syndrome). Therefore, the specific conditions and injuries within the broad cause categories used in Figures 12 and 13 differ slightly from those used in the mortality analysis.

The cause categories used to calculate DALYs lost in Figures 12, 13, 18 and 19 included the following specific conditions and injuries (for more details, please see 'Differences in alcohol-attributable condition and injury categories between mortality and DALY analyses' on page 50):

- **Cancers:** mouth and oropharyngeal cancers, oesophagus cancer, colon cancer, rectum cancer, liver cancer and female breast cancer.
- **Neuro-psychiatric disorders:** alcohol use disorders and epilepsy.
- **Cardiovascular disorders:** hypertensive heart disease, ischaemic heart disease, ischaemic stroke and haemorrhagic stroke.
- **Digestive disorders:** cirrhosis of the liver.
- Other conditions:
- Conditions arising during pregnancy: low birth weight.
- **Respiratory disorders:** tuberculosis and lower respiratory infections (pneumonia).
- **Unintentional injuries**: road traffic injuries, poisonings, falls, fires, drownings and other unintentional injuries.
- **Intentional injuries**: self-inflicted injuries, assault and other intentional injuries.

Figures 12 and 13 illustrate the male and female DALYs lost due to alcohol consumption, showing how YLLs and YLDs contributed to the overall number of DALYs for each cause category. Non-fatal consequences of alcohol consumption (i.e. YLDs) were responsible for a higher proportion of the total alcohol-attributable DALY burden in women (58%) than men (50%).

Males lost more DALYs due to alcohol consumption than females in every category except cancer, where breast cancer resulted in more female DALYs. Figures 12 and 13 further demonstrate the dominant role of neuro-psychiatric disorders in the male and female alcohol-attributable DALY burden, which was almost entirely due to morbidity caused by alcohol use disorders. In males, injuries were responsible for much of the remaining DALY burden, with unintentional and intentional injuries responsible for 33% and 10% of alcohol-attributable DALYs, respectively. In females, unintentional injuries and cancers were each responsible for 18% of the alcohol-attributable DALY burden, with less than 5% of DALYs due to intentional injuries.

Figure 12: Males: Number of DALYs lost due to alcohol consumption, by cause category (0–79 years; 2004).

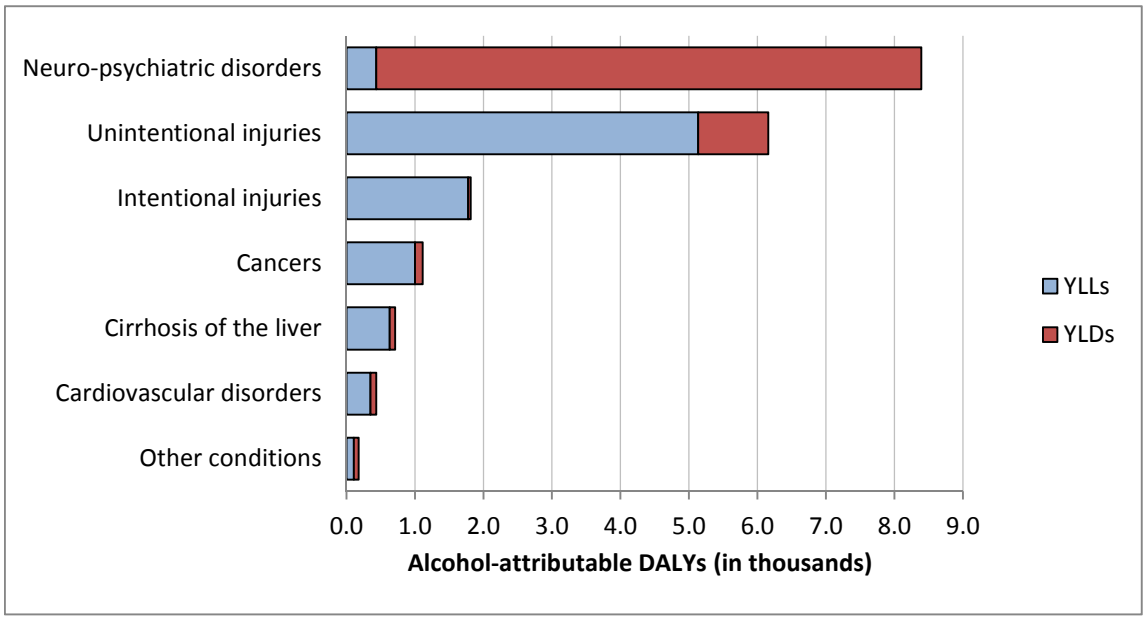
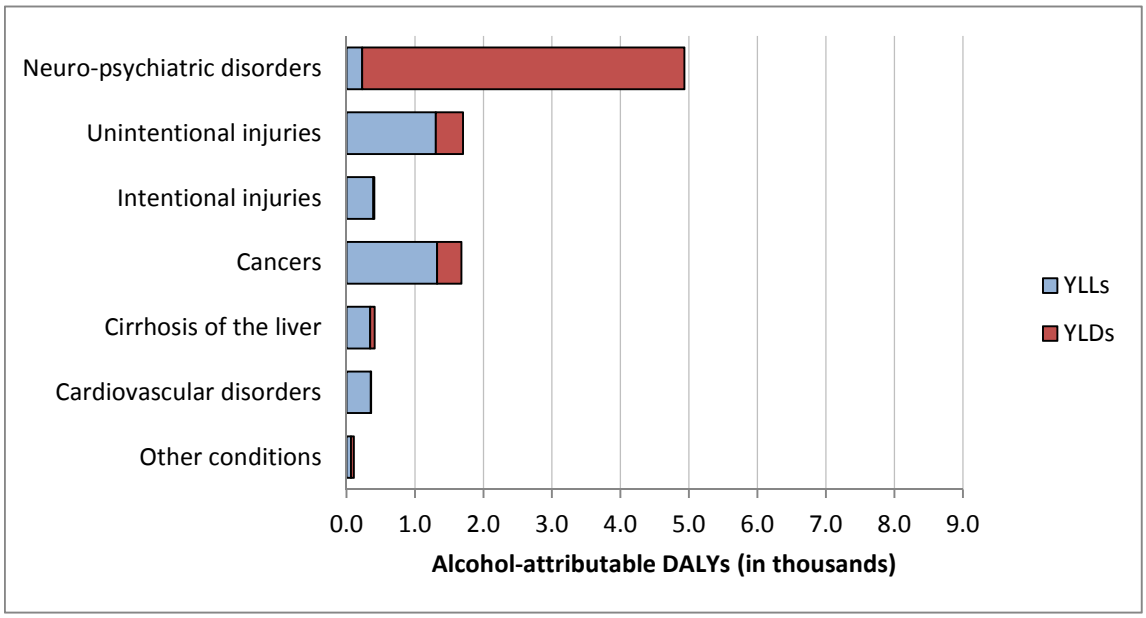


Figure 13: Females: Number of DALYs lost due to alcohol consumption, by cause category (0–79 years; 2004).



See Table 55 for the numbers of DALYs attributable to alcohol consumption by sex and cause. Figures 14 and 15 present these DALYs for the 10 leading causes in men and women, again showing the dominant role of alcohol use disorders and illustrating the relative contributions of YLLs and YLDs within each condition and injury category.

Table 55: Number of alcohol-attributable DALYs lost for each condition and injury category, by sex (0–79 years; 2004).

	Males		Females		Total	
	DALYs	%	DALYs	%	DALYs	%
Conditions						
Mouth and oropharyngeal cancers	321	1.7%	85	0.9%	406	1.4%
Oesophagus cancer	298	1.6%	70	0.7%	368	1.3%
Colon cancer	149	0.8%	198	2.1%	347	1.2%
Rectum cancer	179	1.0%	108	1.1%	287	1.0%
Liver cancer	166	0.9%	45	0.5%	211	0.7%
Female breast cancer			1174	12.2%	1174	4.1%
Alcohol use disorders	7986	42.5%	4798	50.0%	12784	45.0%
Epilepsy	407	2.2%	135	1.4%	541	1.9%
Hypertensive heart disease	107	0.6%	23	0.2%	129	0.5%
Ischaemic heart disease	0	0.0%	60	0.6%	60	0.2%
Ischaemic stroke	6	0.0%	0	0.0%	6	0.0%
Haemorrhagic stroke	322	1.7%	276	2.9%	598	2.1%
Cirrhosis of the liver	713	3.8%	412	4.3%	1125	4.0%
Low birth weight	87	0.5%	77	0.8%	164	0.6%
Tuberculosis	45	0.2%	13	0.1%	57	0.2%
Lower resp. infections: pneumonia	45	0.2%	19	0.2%	64	0.2%
Injuries						0.0%
Road traffic injuries	3526	18.8%	989	10.3%	4515	15.9%
Poisonings	367	2.0%	204	2.1%	572	2.0%
Falls	559	3.0%	85	0.9%	644	2.3%
Fires	117	0.6%	34	0.4%	152	0.5%
Drownings	364	1.9%	48	0.5%	412	1.5%
Other unintentional injuries	1223	6.5%	340	3.5%	1563	5.5%
Self-inflicted injuries	1473	7.8%	297	3.1%	1770	6.2%
Assault	322	1.7%	108	1.1%	430	1.5%
Other intentional injuries	21	0.1%	4	0.0%	25	0.1%
Totals	**18803**	**100.0%**	**9601**	**100.0%**	**28403**	**100.0%**

Figure 14: Males: 10 leading causes of DALYs lost due to alcohol consumption in New Zealand (0–79 years; 2004).

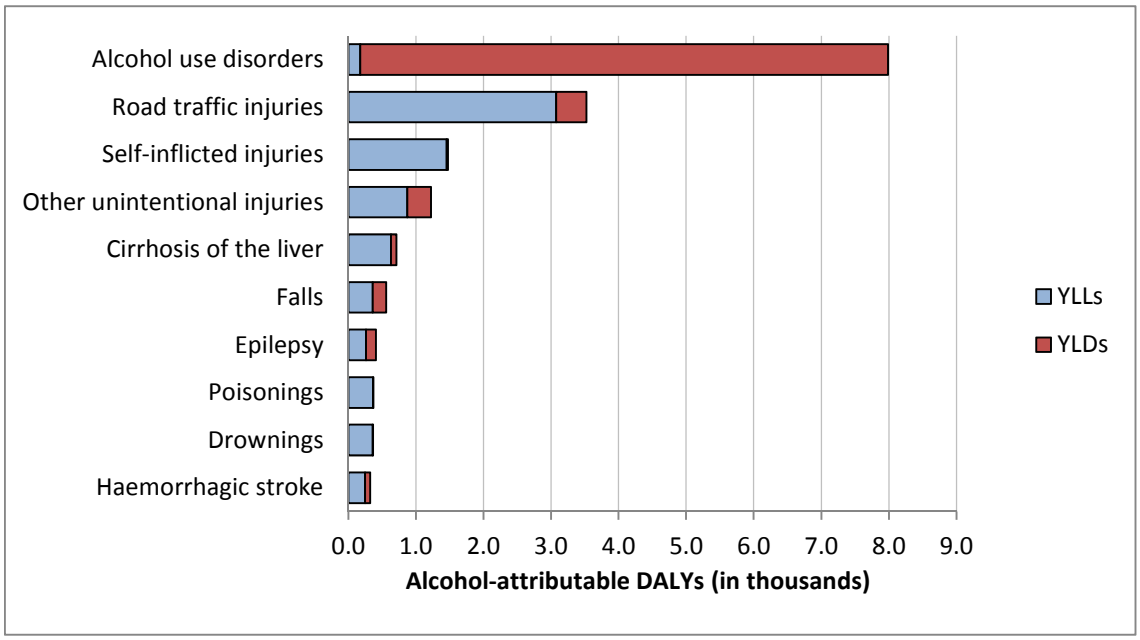
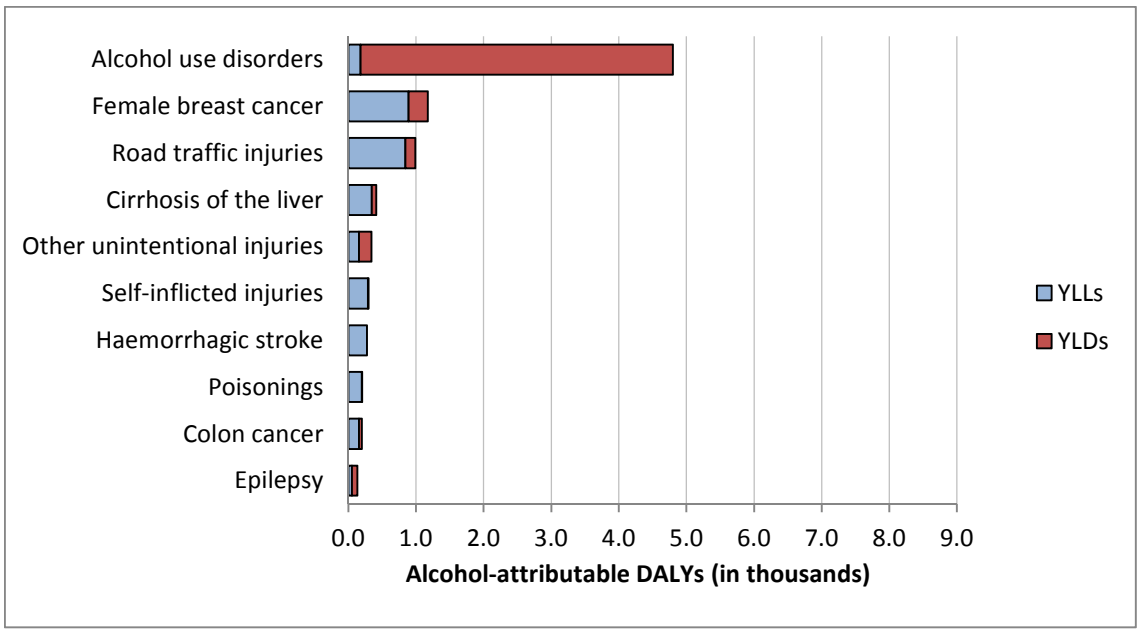


Figure 15: Females: 10 leading causes of DALYs lost due to alcohol consumption in New Zealand (0–79 years; 2004).



DALYS BY AGE/SEX SUBGROUP (2004)

Table 56 shows the leading causes of alcohol-attributable DALYs by age and sex. For male and female New Zealanders, alcohol use disorders were the dominant cause of alcohol-attributable DALYs over 30 years old, while road traffic injuries were responsible for the largest proportion of alcohol-attributable DALYs in 15–29 year old males and females. Numbers of alcohol-attributable DALYs due to injuries and conditions are shown in Table 57.

Table 56: Top five causes of alcohol-attributable disability-adjusted life years (AA DALYs) lost, by age and sex (2004).*

Males	% of AA DALYs	Females	% of AA DALYs
15-29 years	**(N = 4781)**	**15-29 years**	**(N = 1320)**
Road traffic injuries	49.2%	Road traffic injuries	43.9%
Self-inflicted injuries	16.0%	Alcohol use disorders	16.0%
Other unintentional injuries	7.6%	Self-inflicted injuries	11.1%
Alcohol use disorders	5.7%	Other unintentional injuries	7.9%
Falls	4.9%	Poisonings	7.1%
30-44 years	**(N = 6627)**	**30-44 years**	**(N = 3118)**
Alcohol use disorders	57.6%	Alcohol use disorders	61.3%
Road traffic injuries	13.2%	Female breast cancer	11.6%
Self-inflicted injuries	7.8%	Road traffic injuries	9.0%
Other unintentional injuries	6.1%	Cirrhosis of the liver	3.8%
Falls	2.5%	Self-inflicted injuries	3.3%
45-59 years	**(N = 4821)**	**45-59 years**	**(N = 3296)**
Alcohol use disorders	63.8%	Alcohol use disorders	63.0%
Cirrhosis of the liver	6.6%	Female breast cancer	14.4%
Other unintentional injuries	4.0%	Cirrhosis of the liver	6.2%
Mouth and oropharyngeal cancers	3.3%	Haemorrhagic stroke	2.5%
Self-inflicted injuries	3.2%	Poisonings	2.1%
60-69 years	**(N = 1423)**	**60-69 years**	**(N = 1049)**
Alcohol use disorders	44.7%	Alcohol use disorders	46.6%
Cirrhosis of the liver	14.6%	Female breast cancer	19.5%
Oesophagus cancer	6.6%	Colon cancer	6.3%
Mouth and oropharyngeal cancers	6.2%	Haemorrhagic stroke	6.1%
Haemorrhagic stroke	4.1%	Cirrhosis of the liver	4.8%
70-79 years	**(N = 682)**	**70-79 years**	**(N = 549)**
Alcohol use disorders	26.7%	Alcohol use disorders	20.2%
Haemorrhagic stroke	13.6%	Female breast cancer	19.3%
Cirrhosis of the liver	9.7%	Haemorrhagic stroke	17.9%
Colon cancer	6.9%	Colon cancer	10.4%
Mouth and oropharyngeal cancers	6.8%	Cirrhosis of the liver	6.8%

* There were too few alcohol-attributable DALYs in male and female children (0-14 years) to rank by proportions.

Table 57: Alcohol-attributable (AA) condition and injury DALYs lost, by age and sex (2004).

	Age category (years)	AA DALYs lost	% of all DALYs	Conditions: AA DALYs lost	Injuries: AA DALYs lost
Males	0-4	288	1.8%	87	201
	5-14	180	1.6%	0	180
	15-29	4781	12.7%	527	4254
	30-44	6627	16.9%	4269	2359
	45-59	4821	10.0%	4052	769
	60-69	1423	4.4%	1297	126
	70-79	682	2.4%	599	83
	Total	**18803**	**8.8%**	**10830**	**7972**
Females	0-4	180	1.4%	77	103
	5-14	89	0.8%	0	89
	15-29	1320	3.7%	337	982
	30-44	3118	6.4%	2531	587
	45-59	3296	5.6%	3041	255
	60-69	1049	3.5%	987	61
	70-79	549	2.0%	518	31
	Total	**9601**	**4.3%**	**7491**	**2109**

While the number of alcohol-attributable DALYs lost was substantially greater for men than women in all age categories, similar numbers of DALYs were estimated as prevented in men and women (see Figures 16 and 17).

Figure 16: Number of male DALYs caused and prevented by alcohol consumption, by age (2004).

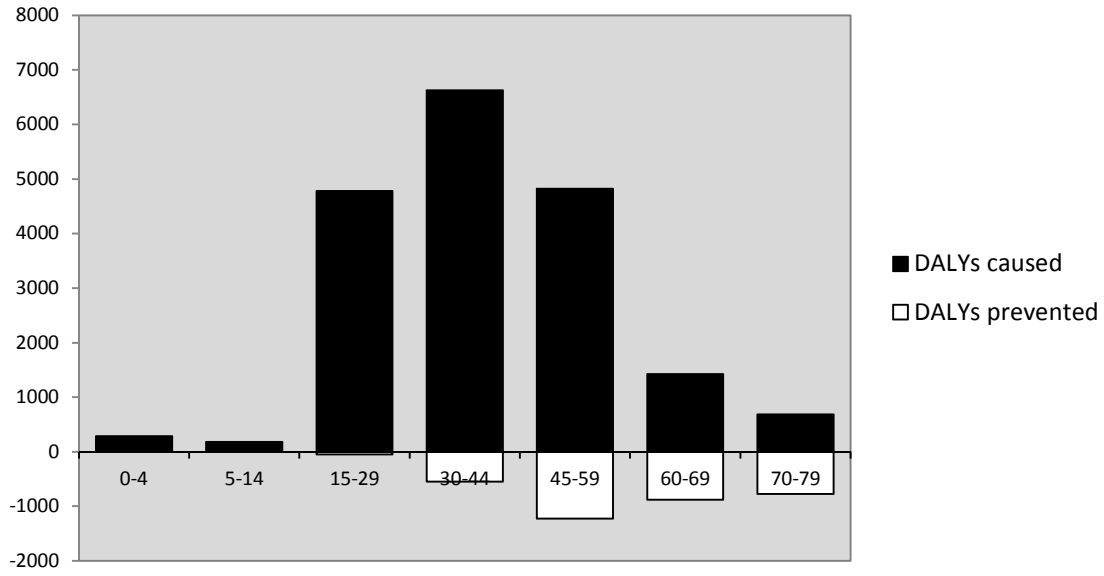
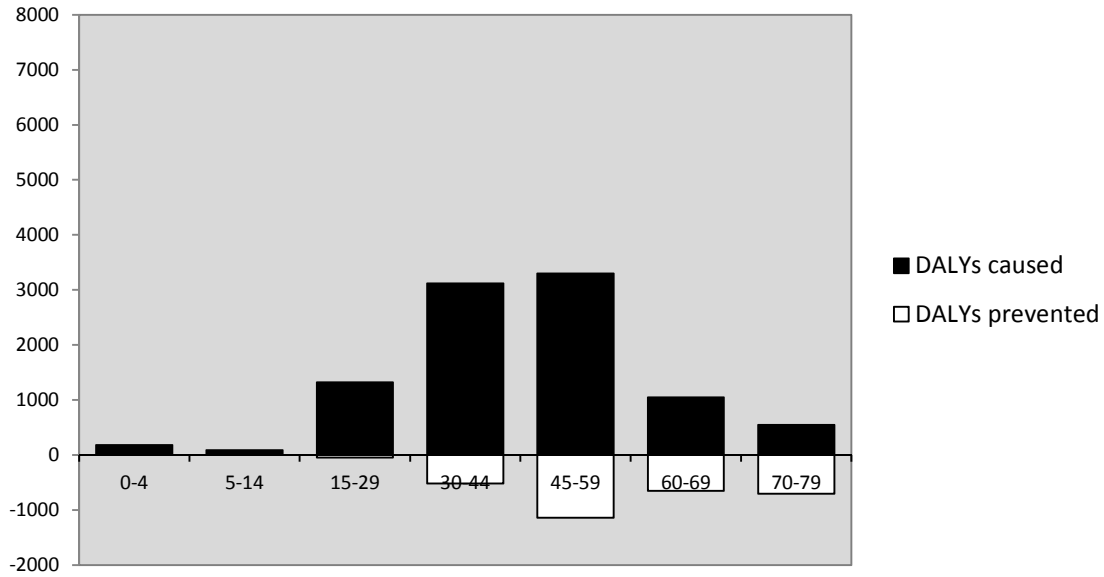


Figure 17: Number of female DALYs caused and prevented by alcohol consumption, by age (2004).



The prominent role of neuro-psychiatric disorders in the DALY burden of middle-aged New Zealanders is illustrated in Figures 18 and 19, with neuro-psychiatric disorders causing approximately 60% of alcohol-attributable DALYs in 30–59 year old men and women. These figures also show the large contribution of injuries to the alcohol-attributable DALY burden in young adult New Zealanders, with alcohol-attributable injuries in 15–29 year olds responsible for

89% and 74% of male and female DALYs, respectively. Finally, the increasing role of cancers and cardiovascular disorders with age is also evident, as seen for alcohol-attributable deaths.

Figure 18: Males: Causes of alcohol-attributable DALYs, by age (2004).

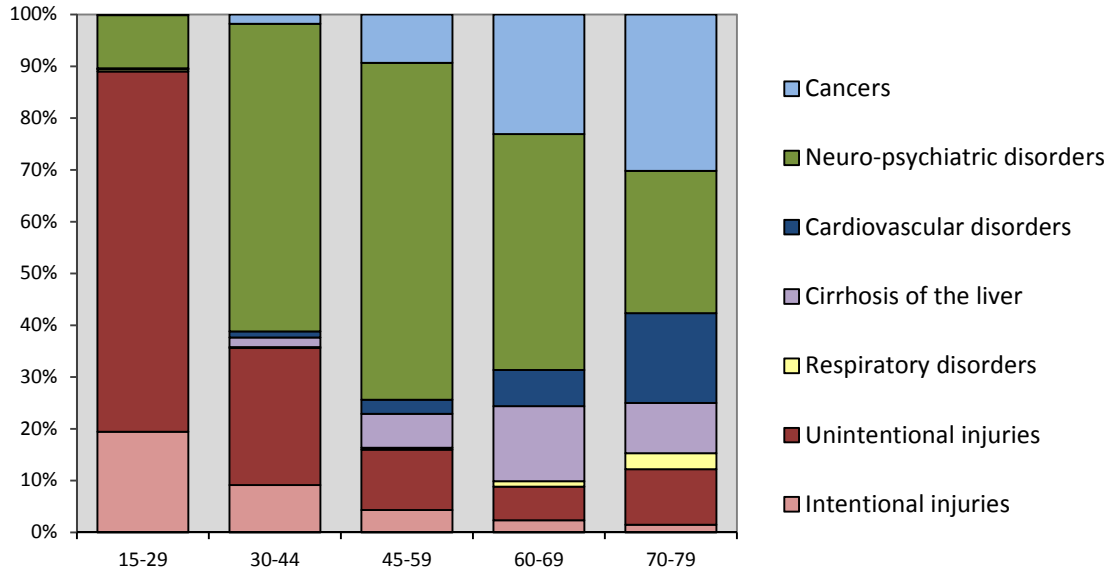
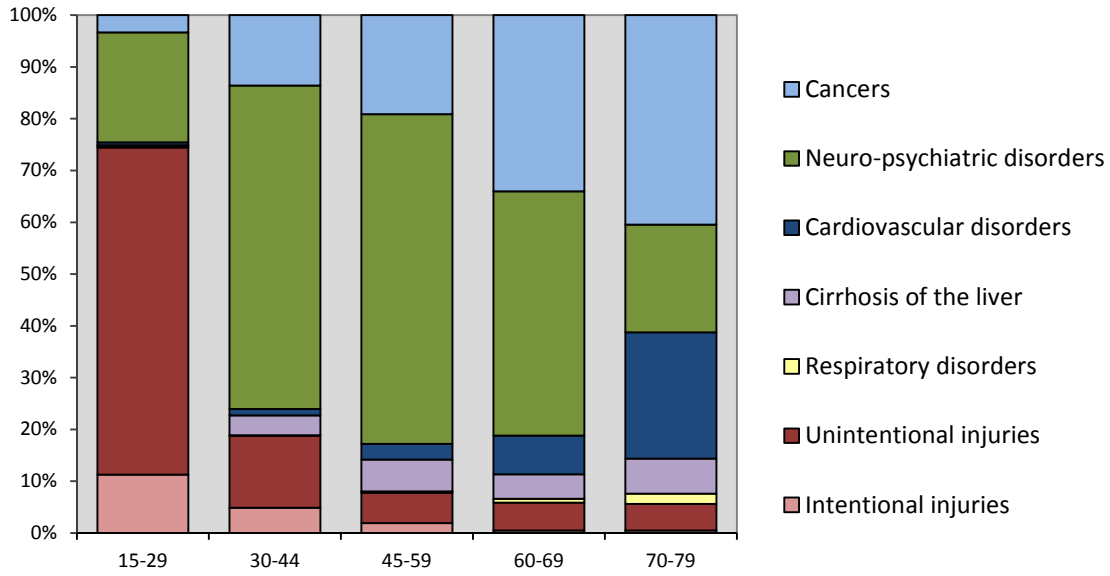


Figure 19: Females: Causes of alcohol-attributable DALYs, by age (2004).



UNIPOLAR DEPRESSIVE DISORDERS: SENSITIVITY ANALYSIS (2004)

Unipolar depressive disorders were excluded from the mortality analysis and the main disability-adjusted life years (DALY) analysis due to inadequacy of the available data for estimating relative risks for the complicated relationship between alcohol and depression (please see pages 35, 51 and 59 for more details about this decision). While the Global Burden of Disease 2010 Risk Factors Collaborating Group has confirmed that alcohol consumption plays a causal role in some unipolar depression, there is currently no established GBD method for quantifying the relationship between alcohol consumption and depression.[2]

Since unipolar depressive disorders contribute substantially to the non-fatal burden of disease, we performed a sensitivity analysis of our DALY calculations using direct estimates of depression AAFs (see page 59 for depression AAF calculation details and Table 29 on page 62 for age/sex-specific AAFs). The sensitivity analysis presented below demonstrates the impact of including depression as an alcohol-related condition on the DALY results.

Overall, the sensitivity analysis estimated that unipolar depressive disorders due to alcohol consumption were responsible for 299 DALYs in males and 249 DALYs in females (1.6% and 2.5% of all male and female alcohol-attributable DALYs, respectively). Table 58 shows the sex-specific alcohol-attributable DALY estimates from the sensitivity analysis (depression included in the calculations) and the main analysis (depression excluded), while Table 59 contrasts estimates from the two analyses by age/sex subgroup.

Table 58: Comparison of depression sensitivity analysis and main analysis: Alcohol-attributable disability-adjusted life years (AA DALYs) lost, by sex (0–79 years; 2004).

	AA DALYs lost (count)	*(results from main analysis)*	% of all DALYs lost	*(results from main analysis)*	AA DALYs lost (rate*)	*(results from main analysis)*
Males	19,102	*(18,803)*	9.0%	*(8.8%)*	949	*(933)*
Females	9,849	*(9,601)*	4.4%	*(4.3%)*	448	*(435)*
Total	28,951	*(28,403)*	6.6%	*(6.5%)*	695	*(680)*

* Rate per 100,000 age-standardised to WHO world population

The addition of alcohol-attributable depression DALYs translates into slightly higher overall estimates of the proportions of all DALYs lost and the standardised rate of DALYs lost for males and females (see Table 58). The age/sex-specific DALY estimates in Table 59 show how most of the alcohol-attributable depression DALYs occur in 15–29 year old males and females (194 and 145 additional DALYs lost, respectively), followed by 30–44 year olds (an increase of 84 male DALYs and 91 female DALYs).

Table 59: Comparison of depression sensitivity analysis and main analysis: Alcohol-attributable disability-adjusted life years (AA DALYs) lost, by age and sex (2004).

	Age category (years)	AA DALYs lost	*(results from main analysis)*	% of total DALYs	*(results from main analysis)*
Males	0-4	288	*(288)*	1.8%	*(1.8%)*
	5-14	180	*(180)*	1.6%	*(1.6%)*
	15-29	4975	*(4781)*	13.3%	*(12.7%)*
	30-44	6711	*(6627)*	17.2%	*(16.9%)*
	45-59	4843	*(4821)*	10.1%	*(10.0%)*
	60-69	1423	*(1423)*	4.4%	*(4.4%)*
	70-79	682	*(682)*	2.4%	*(2.4%)*
	Total	**19102**	***(18803)***	**9.0%**	***(8.8%)***
Females	0-4	180	*(180)*	1.4%	*(1.4%)*
	5-14	89	*(89)*	0.8%	*(0.8%)*
	15-29	1465	*(1320)*	4.1%	*(3.7%)*
	30-44	3209	*(3118)*	6.6%	*(6.4%)*
	45-59	3308	*(3296)*	5.6%	*(5.6%)*
	60-69	1049	*(1049)*	3.5%	*(3.5%)*
	70-79	549	*(549)*	2.0%	*(2.0%)*
	Total	**9849**	***(9601)***	**4.4%**	***(4.3%)***

The sensitivity analysis ranked unipolar depressive disorders as the 8th and 13th highest specific cause of alcohol-attributable DALYs for New Zealand females and males, respectively.

Table 60 shows how 10% of alcohol-attributable DALYs were due to depression in 15–29 year old New Zealand females, with unipolar depressive disorders ranked as the fourth highest specific cause of alcohol-attributable DALYs for this age/sex subgroup.

Table 60: Depression sensitivity analysis: Top five causes of alcohol-attributable disability-adjusted life years (AA DALYs) lost in 15–29 year olds, by sex (2004).

Males	% of AA DALYs	Females	% of AA DALYs
15-29 years	**(N = 4975)**	**15-29 years**	**(N = 1465)**
Road traffic injuries	47.2%	Road traffic injuries	39.6%
Self-inflicted injuries	15.4%	Alcohol use disorders	14.4%
Other unintentional injuries	7.3%	Self-inflicted injuries	10.0%
Alcohol use disorders	5.5%	**Unipolar depressive disorders**	9.9%
Falls	4.7%	Other unintentional injuries	7.2%

For the age groups with the highest prevalence of alcohol dependence (15–29 and 30–44 years), the contribution of depression to the alcohol-attributable burden of disease was further demonstrated when the YLD (years lived with disability) component of DALYs was examined separately. Table 61 shows how depression was in the top five overall causes of alcohol-attributable YLDs for both males and females, while Table 62 demonstrates the high proportion of alcohol-attributable YLDs due to depression in the 15–29 year old age group (18.0% and 23.7% of all alcohol-attributable YLDs in males and females, respectively).

Table 61: Depression sensitivity analysis: Top five causes of alcohol-attributable years lived with disability (AA YLDs), by sex (0–79 years; 2004).

Males	% of AA YLDs (N = 9660)	Females	% of AA YLDs (N = 5825)
Alcohol use disorders	80.8%	Alcohol use disorders	79.3%
Road traffic injuries	4.7%	Female breast cancer	4.9%
Other unintentional injuries	3.6%	**Unipolar depressive disorders**	4.3%
Unipolar depressive disorders	3.1%	Other unintentional injuries	3.1%
Falls	2.0%	Road traffic injuries	2.5%

Table 62: Depression sensitivity analysis: Top five causes of alcohol-attributable years lived with disability (AA YLDs) in 15-44 year olds, by sex (2004).

Males	% of AA YLDs	Females	% of AA YLDs
15-29 years	**(N = 1079)**	**15-29 years**	**(N = 612)**
Road traffic injuries	27.4%	Alcohol use disorders	34.4%
Alcohol use disorders	22.2%	**Unipolar depressive disorders**	23.7%
Unipolar depressive disorders	18.0%	Road traffic injuries	14.6%
Other unintentional injuries	12.1%	Other unintentional injuries	12.0%
Falls	9.2%	Epilepsy	7.1%
30-44 years	**(N = 4274)**	**30-44 years**	**(N = 2226)**
Alcohol use disorders	89.4%	Alcohol use disorders	83.3%
Road traffic injuries	2.7%	Female breast cancer	5.4%
Other unintentional injuries	2.0%	**Unipolar depressive disorders**	4.1%
Unipolar depressive disorders	1.9%	Other unintentional injuries	2.3%
Falls	1.2%	Road traffic injuries	1.6%

DISCUSSION

KEY FINDINGS

The burden of mortality due to alcohol consumption in New Zealanders was estimated as deaths and years of life lost (YLLs). The burden of morbidity (i.e. non-fatal impacts of alcohol consumption on health) was incorporated in estimates of alcohol-attributable disability-adjusted life years (DALYs) that combined the impact of alcohol on mortality (YLLs) and morbidity (years of life lived with a disability; YLDs).

Alcohol is relevant to the health of adults aged 80 years and over. However, data on both alcohol consumption and risk relationships in this age group were considered too unreliable and incomplete to estimate the mortality or DALY burden of alcohol. Therefore, all the results discussed below are only for New Zealanders aged 0–79 years.

2007 Alcohol-attributable mortality

Overall, 802 deaths in New Zealanders aged 0–79 years were attributed to alcohol consumption in 2007, representing 5.4% of all deaths under 80 years old. These deaths represented 13,769 years of life lost (YLLs) attributable to alcohol. Alcohol consumption was also estimated to prevent 351 deaths but only 3,095 YLLs. The alcohol-attributable mortality estimates and key findings were similar in 2004.

Sex and ethnic disparities were observed in the alcohol-attributable mortality burden:

Men were more likely to be harmed by alcohol consumption than women.

- Overall, the number of male deaths due to alcohol consumption (n = 537) was double the number of deaths in women (n = 265) and the alcohol-attributable YLL burden was 2.4 times higher in men (n = 9,720) than women (n = 4,049).
- Alcohol consumption was estimated to cause 6.1% of all male deaths and 4.3% of all female deaths.
- In both Māori and non-Māori, men had more than double the standardised death rates of women (adjusted for the effect of different age structures in sex/ethnicity subgroups).

Alcohol-attributable mortality was higher in Māori than non-Māori.

- The proportion of total annual deaths attributed to alcohol consumption was higher for Māori men and women (8.3% and 5.7%) than non-Māori men and women (5.7% and 4.0%).

- The standardised alcohol-attributable death rate for Māori overall was 2.5 times the rate for non-Māori.
- The age/ethnicity-specific alcohol-attributable death and YLL rates for Māori were more than 1.8 times the corresponding non-Māori rates for each age group.
- Māori males lost the most years of life due to alcohol consumption for almost all age categories, with the rate of YLLs lost peaking in 15–29 year olds.

Injuries were responsible for a large share of the alcohol-attributable mortality burden:

Overall, injuries were responsible for:

- 52% of alcohol-attributable deaths in men (n = 280) and 25% of alcohol-attributable deaths in women (n = 66).
- 73% of the alcohol-attributable YLLs in men (n = 7,066) and 42% of the YLLs in women (n = 1,708).

Most sex and ethnic disparities in alcohol-attributable mortality were due to differences in injury deaths.

Injuries were the dominant cause of alcohol-attributable deaths in adults aged 15–44 years.

- For 15–29 year old males, 30–44 year old males and 15–29 year old females: more than 90% of all alcohol-attributable deaths were due to injuries, and the five leading causes of alcohol-attributable deaths were all injury categories.

There was a transition with increasing age from injuries causing most alcohol-attributable deaths in younger adults (15–44 years) to conditions such as cancers and cardiovascular disorders being responsible for a larger proportion of alcohol-attributable deaths in older age groups (45–79 years). This transition was more apparent and occurred later in life for men than women.

Specific leading causes of alcohol-attributable mortality:

For Māori and non-Māori men:

- Road traffic injuries were the most common cause of alcohol-attributable deaths.
- Self-inflicted injuries, other unintentional injuries and alcoholic liver cirrhosis were also among the leading causes of deaths due to alcohol consumption.

For Māori and non-Māori women:

- Breast cancer was the most common cause of alcohol-attributable deaths.
- Road traffic injuries, haemorrhagic stroke and alcoholic liver cirrhosis were also among the leading causes of deaths due to alcohol consumption.

Road traffic injuries and self-inflicted injuries were the first and second specific leading causes of alcohol-attributable deaths for 15–29 year old males, 30–44 year old males and 15–29 year old females.

Alcoholic liver cirrhosis was a common cause of alcohol-attributable deaths for 30–69 year old females and 45–69 year old males.

2004 Alcohol-attributable disability-adjusted life years (DALYs)

Alcohol-attributable disability-adjusted life years (DALYs) were estimated for 2004, the most recent year for which the required data were available from the WHO Global Burden of Disease study. One lost DALY indicates the loss of one year of full health, as DALYs combine the time lost due to both fatal and non-fatal events (i.e. years of life lost due to premature death (YLLs) and years of 'healthy' life lost due to disability (YLDs)).

Overall, 28,403 years of 'healthy' life (i.e. DALYs) lost in New Zealanders aged 0–79 years were attributed to alcohol consumption in 2004, representing 6.5% of all DALYs lost in New Zealanders under 80 years old. Alcohol consumption was estimated to prevent 6,538 DALYs.

Disparities between men and women were observed in the alcohol-attributable DALY burden:

Men were more likely to be harmed by alcohol consumption than women.

- The number of DALYs lost in men (n = 18,803) was double that of women (n = 9,601).
- Alcohol consumption was estimated to cause 8.8% of all male DALYs and 4.3% of all female DALYs.
- The standardised rate of DALYs lost due to alcohol consumption was 2.1 times higher in men than women.

Alcohol use disorders and injuries were responsible for a large proportion of the alcohol-attributable DALY burden:

Alcohol use disorders:

- Overall, alcohol use disorders were the leading cause of alcohol-attributable DALYs for both men (43%) and women (50%).
- The contribution of alcohol use disorders to the DALY burden was almost entirely due to non-fatal effects (i.e. YLDs).

Injuries:

- Overall, injuries were responsible for 42% of the alcohol-attributable DALY burden in men (n = 7,972) and 22% of the DALY burden in women (n = 2,109).

- Injuries were the dominant cause of alcohol-attributable deaths and DALYs in young adults. For 15–29 year olds, 89% of all alcohol-attributable DALYs in males and 74% of all alcohol-attributable DALYs in females were due to injuries.

Specific leading causes of alcohol-attributable DALYs:

Alcohol use disorders were the dominant cause of alcohol-attributable DALYs in men and women over 30 years old.

Road traffic injuries were responsible for the largest proportion of alcohol-attributable DALYs in 15–29 year old males and females.

STUDY LIMITATIONS

This report used the most current data and methodologies available to calculate estimates of mortality and morbidity due to alcohol-attributable conditions and injuries in New Zealand. However, there are a number of important limitations associated with this analysis that should be considered when interpreting or using the estimates within this report. Potential weaknesses are summarised below and most have been previously mentioned in the report.

Alcohol consumption estimates

Alcohol consumption data were obtained from cross-sectional self-reported national population survey estimates.

- These may underestimate average alcohol consumption and the prevalence/magnitude of heavy drinking occasions in the general New Zealand population, due to socially desirable responses and because heavy drinkers are likely to be under-represented.[58]
- Alcohol consumption was estimated for respondents at the time of each survey. Since mortality and morbidity outcomes were measured for the same years as the survey data, the temporal relationship between alcohol consumption and impact is unrealistic for chronic conditions. We were not able to examine the impact of previous alcohol consumption (i.e. longitudinal changes in drinking) in this analysis.
- New Zealanders who did not live in private dwellings (e.g. homeless or institutionalised) were not included in the survey estimates and were likely to have very different drinking habits than the general population. However, the impact of this limitation on our results is expected to be small, since these subgroups comprise a relatively small proportion of the total New Zealand population under 80 years old.
- Several methodological differences between the two main surveys used for estimating alcohol consumption mean that comparisons between the 2004 and 2007 alcohol consumption estimates may not reflect only differences in consumption.
- We acknowledge that alcohol consumption patterns and therefore health burden due to alcohol will vary by characteristics other than sex, age, and Māori/non-Māori

ethnicity. For example, there may be differences by region, rurality, or specific non-Māori ethnicities, that have not been examined.

Higher degree of uncertainty for estimates of alcohol consumption in some subgroups.

- Older age categories: Limited alcohol consumption data were available, and the surveys we used for our main data sources only included participants up to 65 years old. Alcohol consumption estimates for the two oldest age categories were therefore estimated with additional survey data and extrapolation methods, increasing the level of uncertainty surrounding these estimates (see 'Alcohol consumption estimates for older age categories' on page 26).
- Pregnant women: Limited alcohol consumption data were available (see 'Alcohol consumption estimates for pregnant women' on page 27).
- Māori: Due to smaller survey sample sizes for Māori (particularly in older age categories and pregnant women), Māori alcohol consumption estimates are subject to a higher degree of uncertainty.

Measurement of alcohol-attributable outcomes

The scope of this report is limited by its methodology to health conditions and injuries as defined by the ICD-10 and Global Burden of Disease (GBD) 2005/2010 study.

- Attributing each death to a single direct cause is a simplification which does not account for the role of antecedent, underlying and/or overlapping causes. This could under- or over-estimate the impact of alcohol on mortality. New Zealand mortality data are also collated from several sources (i.e. death certificates from doctors and coroners, post-mortem reports from private pathologists and hospitals, and death registration forms from funeral directors), and the accuracy of causal attribution is unknown.
- Some alcohol-related conditions did not have sufficient epidemiological data to calculate risk relations for the GBD 2010 Risk Factors Assessment for alcohol;[2] we were therefore unable to include them in our analysis.
    - While the GBD 2010 Risk Factors Collaborating Group was unable to quantify the impact of alcohol on unipolar depressive disorders, they agreed that a causal relationship did exist. Given the large contribution of depression to morbidity (i.e. DALYs), we have included a sensitivity analysis that uses direct estimates of depression AAFs to roughly quantify alcohol-attributable DALYs due to depression.
- We were unable to include some important alcohol-attributable outcomes that have been shown to contribute substantially to the health burden of alcohol in New Zealand:[59]
    - Social consequences of alcohol consumption: There is a large overlap between the social and health consequences of alcohol consumption. Heavy

drinking often has an impact on the social functioning of drinkers, their partners and children, and others, with consequent mental and physical health effects which are not represented in a study of this kind.

- o Harm due to other people's alcohol consumption: We were only able to estimate harm caused to people other than the drinker for road traffic injuries, fires and drownings in 0–14 year olds, and assaults in all age categories.

Assumptions used for the YLL and YLD calculations influenced the results.

- World Health Organization (WHO) age/sex-specific estimates of New Zealand morbidity (YLDs) were used, since the required data were not readily available from New Zealand sources. Since the WHO estimates were not ethnicity-specific, DALYs could not be calculated separately for Māori and non-Māori.

Our results were influenced by our choice to use time-discounting and age-weighting for YLLs and YLDs, the life table used to calculate YLLs, and the disability weights used by WHO for YLD calculations. These are the standard methods used in recent GBD study publications,47,48 other national-level burden of disease analyses,19,49 and the previous NZBoA2000/02 report.[1]

Quantification of relationships between alcohol consumption and health outcomes

The estimates of relative risks (RRs) and alcohol-attributable fractions (AAFs) that we used to quantify the amount of alcohol-attributable mortality and morbidity have several sources of uncertainty.

- While we used the best available relative risk estimates to calculate the AAFs, these estimates are only as good as the best epidemiological studies that have been performed to date, so there is potential for residual confounding and other sources of error. This is a particular concern with respect to preventive effects because the direction of expected confounding and biases would overestimate the magnitude of the relative risk (i.e. overestimate protective effect), whereas the relative risks for harmful effects are more likely to be underestimates.
- Due to insufficient New Zealand epidemiological data, we depended heavily on risk estimates from meta-analyses that included data from studies performed in other countries. The generalisability of these estimates from the source populations to the New Zealand population is an assumption; this limitation is common to all burden of disease and injury studies.
- RRs used to calculate AAFs were not age-specific.
- Ideally, the calculation of mortality and morbidity risk estimates would be based on data from studies that examine mortality and morbidity outcomes separately. However, since such data are usually not available, adjustment factors are often used instead.
- For the injury sensitivity analysis, the GBD 2010 Risk Factors Collaborating Group used the same RRs to calculate AAFs for all non-road traffic injuries since individual meta-analyses were not possible due to the limited body of research on different injury types.[60]

Due to our use of lifetime abstainers as a reference population, our results show the mortality and morbidity burden due to all alcohol consumption. Future studies may wish to include other reference populations in order to measure the potential reduction in harm under more realistic counterfactual scenarios (e.g. if the New Zealand population were all regular light drinkers).[61]

Methodological limitations meant that we could only consider patterns of drinking in our calculations of the alcohol-attributable burden due to ischaemic heart disease and injuries. However, it is likely that drinking patterns also affect the development of other conditions.

We were not able to account for cultural or contextual differences that could modify the relationships between alcohol consumption and health outcomes due to intoxication (e.g. intentional injuries).

Interpretation of results

The validity of comparisons between the results for some subgroups is limited by the uncertainty of estimates due to small sample sizes, particularly in older age categories and Māori.

The results are not directly comparable with the results of the previous report (i.e. as a tool for monitoring the impact of changes in alcohol consumption). This is because the methodology used to produce the estimates presented in the current report differs from the NZBoA2000/02 estimates in several respects, including the following major points (for more details, please see the 'Methodological developments' section starting on page 64):

- People older than 80 years were not included in our analysis.
- Four new condition categories were included.
- There were methodological differences between the alcohol consumption surveys.
- Updated RRs were used to calculate the AAFs:
    - the RRs in the current report were derived from a much larger and more current evidence base.
    - ex-drinkers and lifetime abstainers were considered separately.
    - separate RRs were used for ischaemic and haemorrhagic stroke.
    - morbidity RRs were available for several conditions.
    - drinking pattern information was included in ischaemic heart disease calculations.

Caution is required when interpreting the preventive effects of alcohol, as they always need to be considered alongside the greater alcohol-attributable health risks rather than in isolation.

Our results are all presented as point estimates, with an unquantified degree of uncertainty surrounding each estimate. It is possible to calculate the uncertainty of AAF estimates using complex simulation methods,[9,62] but this was not considered a priority for our report.

Despite the limitations presented above, the updated methods we used to calculate the alcohol-attributable burden of disease and injury in this report mean that the burden estimates presented in this report are an improvement over those presented in the previous NZBoA2000/02 report.

COMPARISON WITH PREVIOUS ANALYSES

Our results clearly show the substantial contribution of alcohol to the burden of disease and injury in New Zealand during 2004 and 2007.

As previously discussed in the 'Methodological developments' section, there have been several changes in methods since the previous NZBoA2000/02 report[1] estimated the alcohol-attributable burden of alcohol in New Zealand. Therefore, our 2004/2007 results are not directly comparable with the previous 2000/02 results, and any differences are due to a combination of several factors, not solely changes in alcohol consumption of New Zealanders. One major difference was the restriction of our 2004/2007 analyses to people under 80 years old due to the unreliability of the alcohol consumption and risk estimates for older age groups, whereas the NZBoA2000/02 report included all ages. Notwithstanding other differences between the two reports, when we excluded the 80+ years age group from the NZBoA2000/02 analysis, the proportion of all deaths attributed to alcohol in 2000 was 5.7%, a similar result to the proportions calculated for 2004 (5.1%) and 2007 (5.4%) in the current report.

As the Global Burden of Disease and Injury (GBD) 2005/2010 study is not yet complete, the most recent GBD estimates available are for 2004.[63] Our methods were broadly similar to those used by the GBD, but several differences do exist that limit comparability (including the use of *net* deaths and DALYs by the GBD), and the GBD estimates are limited to broad World Health Organization regions and selected countries. Despite these limitations, many of the GBD findings for high-income populations are generally similar to those presented in this report. For example, alcohol-attributable deaths as a proportion of all deaths in the WHO Western Pacific region (WPR), American region (AMR) and European region (EUR) were 5.3%, 5.6% and 6.5%, respectively.[63] The overall proportions of alcohol-attributable disability-adjusted life years (DALYs) for the WHO regions (7.2% for WPR, 9.2% for AMR and 11.6% for EUR) were higher than our New Zealand estimate (6.5% of all 2004 DALYs lost). However, all of these proportions depend on competing causes of deaths and DALYs as well as level of alcohol-related harm.

The estimated proportions of total deaths and DALYs attributable to alcohol in New Zealand were higher than to the net global estimates of 3.8% for deaths and 4.6% for DALYs.[63] As found in New Zealand, sex disparities were present in all global and regional alcohol-attributable death and DALY estimates, with men more likely to be harmed by alcohol consumption than women. The broad categories responsible for most global deaths due to alcohol consumption (i.e. injury, cancer, cardiovascular disease, and liver cirrhosis) were also leading causes of death in New Zealand.[63]

Some countries that have recently completed comparable country-level assessments of the alcohol-attributable health burden include the United States,[64] Canada[65] and Scotland.[18] While each country used slightly different methods, they shared the same general approach.

In contrast to the methods we used to estimate the New Zealand burden, the United States analysis:[64] was restricted to people aged 15–64 years; adjusted survey estimates of alcohol consumption for undercoverage; used the 2005 U.S. population instead of the WHO world population to calculate standardised rates; and estimated injury alcohol-attributable fractions (AAFs) with GBD models that result in higher AAFs than those used in our main analysis (see 0 3 for a sensitivity analysis that shows the effect of using GBD injury AAFs). Alcohol-attributable mortality was estimated by Shield *et al.* for the United States for 2005, with alcohol responsible for 9% of all 15–64 year old deaths (12% for men and 4% for women).[65] This was the first report to examine the alcohol-attributable burden in the United States by both sex and ethnicity. Similar to New Zealand, there were health disparities in the United States across ethnicities, with Native Americans showing the highest standardised alcohol-attributable mortality and YLL rates. Sex differences were also present, with men in every ethnic group experiencing more than three times the amount of alcohol-attributable harm when compared to women).[65] Population standardised alcohol-attributable death rates for 2005 varied widely between U.S. sex/ethnicity subgroups, ranging from 2 deaths per 100,000 female Asian/Pacific Islanders to 130 per 100,000 male Native Americans.[65] Standardised death rates for New Zealand sex/ethnicity subgroups also showed considerable variation, ranging from 8.1 alcohol-attributable deaths per 100,000 in non-Māori females to 46.5 per 100,000 Māori males in 2007.

The Canadian analysis included people aged 0–64 years in 2005 and calculated confidence intervals for their estimates.[65] While they did not perform analyses by ethnicity, the other methods were mostly similar to the U.S. study, including the upshifting of alcohol survey estimates and the use of injury AAFs modelled using GBD methods.[65] Alcohol-attributable deaths were estimated at 7.7% of all 0–64 year old deaths and alcohol-attributable YLLs at 8.0% of all YLLs, with the wide confidence intervals (95% CI for deaths: 1.6% to 13.9%; YLLs: 2.2% to 14.1%) illustrating the high degree of uncertainty associated with burden estimates. Similar to New Zealand, alcohol was shown to impact the health of men more than women, with 75% of alcohol-attributable deaths occurring in men.[65] Overall, the largest contributors to alcohol-attributable death in Canada were similar to those in New Zealand: unintentional injuries (particularly road traffic injuries), cancers, cirrhosis of the liver, and self-inflicted injuries. While the leading causes of alcohol-attributable deaths in Canadian men and women were also generally similar to New Zealand, their ranks and proportions varied somewhat between countries. The top three causes of alcohol-attributable death in Canadian men aged 0–64 years were: cirrhosis of the liver (20.2%), road traffic injuries (19.9%) and self-inflicted injuries (15.5%).[65] In Canadian women the top causes were: breast cancer (30.1%), cirrhosis of the liver (27.2%) and road traffic injuries (7.5%).[65] As for New Zealand, the Canadian analysis showed that road traffic injuries and self-inflicted injuries were the top two specific leading causes of alcohol-attributable deaths for several younger age groups: 15–24 and 25–34 year old males and females and 35–44 year old males.[65]

The Scottish report calculated alcohol-attributable mortality for men and women aged 16 years and older in 2003.[18] In contrast to the methods used in the New Zealand, United States and Canadian analyses, the Scottish report did not consider ex-drinkers separately; therefore all people who reported no alcohol consumption within the previous year were included in the non-drinkers reference group. Injury AAFs for Scotland were estimated directly from case series and other primary data sources, using a similar approach to our New Zealand injury AAF estimates. Alcohol-attributable

deaths were estimated at 5.0% of all deaths among adults aged 16 years and over (6.8% in men and 3.3% in women).[18] The proportions of alcohol-attributable deaths were highest in younger age groups, peaking in 35–44 year old men (26.1% of all deaths) and women (21.1% of all deaths).[18] While more deaths due to alcohol consumption were also seen in younger New Zealanders, the age group with the highest proportions of overall deaths attributable to alcohol was younger (15–29 years), with 26.6% of male deaths and 14.8% of female deaths in this age group attributed to alcohol consumption. The corresponding Scottish proportions for alcohol-attributable deaths in 16–24 year old males and females were 17.5% and 9.9% of all 16–24 year old male and female deaths, respectively.[18] When considering alcohol-attributable deaths by age/sex subgroups, road traffic injuries and self-inflicted injuries were again the leading causes in younger age groups in Scotland during 2003: 16–24 year old males and females, and 25–34 year old males.[18] Alcoholic liver cirrhosis was the top cause of Scottish alcohol-attributable deaths for both men and women between 35 and 74 years of age,[18] a finding that was similar in New Zealand males. New Zealand females aged 30–69 years differed slightly, with breast cancer as the top cause of alcohol-attributable deaths and alcoholic liver cirrhosis in second or third place. Compared to New Zealand, mental and behavioural disorders (i.e. alcohol use disorders) figured more prominently as a cause of alcohol-attributable deaths in Scottish men and women aged 35–64 years.

PUBLIC HEALTH IMPLICATIONS

Overall, our analysis shows that alcohol consumption is a major risk factor for burden of disease and injury. The average volume of alcohol consumption and patterns of drinking, especially heavy drinking occasions, contribute to this disease burden. Alcohol is linked to many disease categories, but alcohol-use disorders, cancer, cardiovascular disease, liver cirrhosis, and injury are the most important disease categories causally affected by alcohol. This is consistent with findings from the Global Burden of Disease study.[63]

In this report we have taken the approach of incorporating the putative beneficial effects of alcohol (largely from ischaemic heart disease, diabetes, and ischaemic stroke) based on estimates from meta-analyses of cohort studies. However, we note:

- The magnitude of the relative risks is controversial. There are several identified sources of uncontrolled error in the cohort studies and their meta-analyses that have been previously described.[66,67] Without the prospect of randomised trials to answer the question definitively, it is likely that, (a) the benefits are exaggerated by uncontrolled confounding, as has been seen in the analogous situation with the effect of hormone replacement therapy on ischaemic heart disease,[66,68,69] and (b) the 'dose' required for maximal beneficial effect is underestimated due to under-reporting of alcohol consumption.[67]
- The net effect of alcohol on cardiovascular disease might be beneficial in subgroups of the population in which alcohol is regularly consumed lightly to moderately without heavy drinking occasions, but this benefit is restricted to older people only. In other subgroups, where this is not the case, no net protective effect on ischaemic heart

disease is expected, and the overall effect of alcohol on cardiovascular disease will be detrimental because of its harmful effect on haemorrhagic stroke and hypertensive disorders. Even in subgroups in which the net effect on cardiovascular disease is beneficial, the overall effect of alcohol on the burden of disease is detrimental.[63]

- The same regular low-dose drinking pattern that has been promoted for the reduction of ischaemic heart disease for many years is associated with a significant increase in risk of cancer. This includes breast cancer, the commonest cause of cancer death for New Zealand women.
- Finally, there are no grounds for the promotion of alcohol as a therapeutic agent, regardless of evidence of a beneficial effect, given its addictive, carcinogenic, intoxicating and toxic properties. There are safe and effective agents available for the lowering of cardiovascular risk, for which the appropriate doses can be determined and delivered, according to evidence-based guidelines.[70]

The main messages from the previous report are upheld by the current analysis.

1. There are no health benefits of drinking before middle age, and benefits in later life are uncertain.
2. The pattern of drinking is very important in determining the health effects of alcohol consumption.
3. Injury is responsible for a large proportion of the alcohol burden: 43% of alcohol-attributable deaths, 63% of years of life lost and 36% of DALYs lost due to alcohol.
4. There is a huge burden of disability due to alcohol use disorders that is not reflected in mortality figures.
5. The health burden of alcohol falls inequitably on Māori.
6. The health of men as measured in this study is more affected by alcohol than the health of women. This may not apply to health impacts that are outside the scope of this study, such as harm from the drinking of others.

No level of alcohol consumption is without risk, although high average consumption and frequency of heavy drinking occasions are associated with the most risk of harm to the drinker and to others.

The effects of alcohol on public health are large enough to motivate population-wide interventions in New Zealand and globally. We know more than ever about which strategies can effectively and cost-effectively control alcohol-related harms.[71,72] WHO's Global strategy to reduce harmful use of alcohol was ratified at the World Health Assembly in 2010, to coordinate an effective evidence-based response.[73]

The interventions that change the drinking environment of the whole population can reduce average consumption and alcohol-related harm, including in population subgroups at highest risk.

These focus on increasing the price of alcohol, decreasing availability (number of outlets as well as hours and days of sale), and reducing alcohol promotion and marketing. Increasing the minimum legal purchase age for alcohol has also been shown to be effective in reducing harm. There are interventions specific to the contexts in which injuries occur that have been shown to be effective, largely for prevention of traffic injury (e.g. lowering the legal blood alcohol concentration limit for driving; increased random breath testing and other enforcement; alcohol treatment for repeat offenders), but also violence associated with licensed premises (e.g. design of premises; enforcement of licence conditions; closing hours).

Finally, increased use of screening and brief intervention, and better availability of treatment services for identified heavy drinkers (via primary and secondary healthcare, courts, and prisons) are individual-focused interventions for which there is research evidence of effectiveness.[71,72] A detailed set of recommendations to reduce alcohol-related harm in New Zealand, based on international research evidence and tailored to the New Zealand policy environment, was put forward by the New Zealand Law Commission at the conclusion of an extensive review in 2010.[3]

GLOSSARY OF ACRONYMS AND TERMS

Acronym/Term	Definition
AAF	Alcohol-attributable fraction. The AAF is the proportion of a given condition or injury that would have been prevented if none of the individuals in a specified population had consumed alcohol. This is also known as the population attributable fraction (PAF) or population attributable risk (PAR) due to alcohol. The AAF varies for different health conditions/injuries and population subgroups. An AAF can be negative if alcohol reduces risk or is protective for the defined group and condition. (Also see page 33.)
CRA	Comparative risk assessment.
DALY	Disability-adjusted life year. DALY = YLL + YLD. DALYs are a summary measure of population health. One DALY for a specific health condition can be thought of as one lost year of 'healthy' life due to the specified condition, and the burden of disease in DALYs as a measurement of the gap between the current health of the population and an ideal situation where everyone lives to old age in full health. (Also see page 49.)
GBD	Global Burden of Disease and Injury.
GENACIS2007	2007 Gender, Alcohol and Culture: An International Survey – New Zealand.[23,24]
HBS2003/04	2003/04 Health Behaviours Survey – Alcohol Use.[20]
HDO	Heavy drinking occasion (i.e. binge drinking episode). Used to describe and/or measure *pattern* of drinking. Precise definition varies depending on source and use. For males, it is often defined as 60+ g of pure alcohol consumed during a single occasion, while the female definition sometimes has a lower cut off (i.e. 40+ g).
HtO2008/09	2008/09 SHORE's Harm to Others Survey.[26]
ICD-10	The International Classification of Diseases, 10th revision. The international standard diagnostic classification for epidemiology, health management and clinical purposes.
Irregular HDOs	Heavy drinking occasions that occur *at least monthly, but not daily*.
NZADUS2007/08	2007/08 New Zealand Alcohol and Drug Use Survey.[25]
NZBoA2000/02	2004 New Zealand Burden of Alcohol report.[1]
NZHS2006/07	2006/07 New Zealand Health Survey.[22]

Acronym/Term	Definition
NZMHS2003/04	Te Rau Hinengaro: 2003/04 New Zealand Mental Health Survey.[21]
People with HDOs	People with heavy drinking occasions that occur *at least monthly, including daily.* Includes people with irregular HDOs and people with regular HDOs.
Regular HDOs	Heavy drinking occasions that occur *daily.*
RR	Relative risk. The ratio of the probability of an exposed person (i.e. drinker or ex-drinker) dying or suffering from a specified condition compared to an unexposed person (i.e. lifetime abstainer), when all other factors are equal). (Also see page 35.)
SHORE	Centre for Social and Health Outcomes Research and Evaluation. (Massey University, Auckland)
WHO	World Health Organization.
Wpr-A	One of 14 World Health Organization subregions defined based on region and mortality level (Western Pacific Region; mortality stratum A – very low child mortality and very low adult mortality). Wpr-A is comprised of the WHO Member States of New Zealand, Australia, Brunei Darussalam, Japan and Singapore.
YLD	Years lost due to disability. Years of 'healthy' life lost due to living in a state of poor health or disability. (Also see page 57.)
YLL	Years of life lost due to premature mortality. (Also see page 48.)

APPENDIX A:DETAILED INFORMATION ON ICD-10 CODES AND IMPACT OF ALCOHOL FOR ALCOHOL-RELATED CONDITIONS LISTED IN TABLE 3.

ICD-10 codes: Differences between the Global Burden of Disease (GBD) 2005/2010 study and the NZBoA2000/02 report.

Mouth and oropharyngeal cancers	GBD 2005/2010 excludes C14 (Malignant neoplasm of other and ill-defined sites in the lip, oral cavity and pharynx). We included C14 because knowledge of the exact location of the cancer is not necessary for the purposes of our analyses.
Alcohol use disorders	GBD 2005/2010 also includes X45 (accidental poisoning by and exposure to alcohol). We categorise X45 as an unintentional injury.
Unipolar depressive disorders	F34 (persistent mood [affective] disorders) was not included for unipolar depressive disorders in the NZBoA2000/02 report. Inconsequential change since no F34 deaths were recorded in 2004 or 2007.
Hypertensive heart disease	GBD 2005/2010 does not include I10 (primary hypertension). We include I10 in this analysis because Rehm *et al.*[2] included I10 in their RR calculations due to a lack of epidemiological data for I11–I13 only.
Stroke	I68 (cerebrovascular disorders in diseases classified elsewhere) was included in the NZBoA2000/02 report's stroke category, but is not included by GBD 2005/2010 or Rehm *et al.* 2010. Inconsequential change since there are no I68 deaths in 2004 or 2007. GBD 2005/2010 excludes I69 except for I69.0 (sequelae of subarachnoid haemorrhage), I69.1 (sequelae of intracerebral haemorrhage), I69.2 (sequelae of other nontraumatic intracranial haemorrhage) and I69.3 (sequelae of cerebral infarction). See report text for detailed description of how mortality numbers for different stroke subtypes were determined.
Oesophageal varices	No GBD 2005/2010 category.
Alcoholic liver cirrhosis	GBD 2005/2010 has a broader category (Cirrhosis of the liver: K70, K73–K74). See report text for detailed description of how mortality numbers were determined for our analysis.
Cholelithiasis	GBD 2005/2010 has a broader category (Gall bladder and bile duct disease: K80–K83). Not specific enough for our purposes, so we used only K80.

ICD-10 codes: Differences between the Global Burden of Disease (GBD) 2005/2010 study and the NZBoA2000/02 report.	
Pancreatitis	K86 (other diseases of pancreas) was not included in NZBoA2000/02 report. We include K86 in our analysis since both GBD 2005/2010 and Rehm *et al.* 2010 included this additional code.
Low birth weight	GBD 2005/2010 has a broader category (Preterm birth complications: P05–07, P22, P25–P28, P77). Not specific enough for our purposes, so we used P05–07.
Tuberculosis	GBD 2005/2010 also includes P37.0 (congenital tuberculosis). Inconsequential difference since there are no deaths from P37 in our dataset.
Lower respiratory infections: pneumonia	GBD 2005/2010 has a broader category for lower respiratory infections (J09–J22, J85, P23). However, Rehm *et al.* (2010) note: "Influenza and pneumonia had not been included into the GBD so far. However, the transfer to GBD is only possible for disease categories with J10–J18 as definition, as the epidemiological studies are usually restricted to these codes. Also, the impact of alcohol use is restricted to community-acquired pneumonia". Therefore, our use of J10–J18 will avoid overestimating the impact of alcohol on lower respiratory infections.
Diabetes mellitus	GBD 2005/2010 excludes E14 (unspecified diabetes mellitus). We include E14 because diagnostic specificity for this disease is not critical for the purposes of our analyses.

APPENDIX B: VARIATIONS FROM ICD CODES USED BY TAYLOR *ET AL.*[74] FOR ALCOHOL-ATTRIBUTABLE INJURY CALCULATIONS.

Injury category	This report
Unintentional injuries	
Road traffic injuries	Included: V88, Y32,[*] Y85 Excluded: V80–85
Alcohol poisonings	Included as a separate category from non-alcohol poisonings since they are 100% attributable to alcohol: X45, X65 & Y15
Non-alcohol poisonings	Included: Y10–Y14,[*] Y16–Y18[*] Excluded: X45 (alcohol poisoning)
Falls	Included: Y30–Y31[*]
Fires	
Drownings	Included: Y21[*]
Other unintentional injuries	Included: V80–V85, (Y19–Y20, Y22–Y29)[*†] Excluded: V88, (Y40–Y85, Y88),[‡] Y89
Intentional injuries	
Self-inflicted injuries	Excluded: Y87.0
Assault	Excluded: Y87.1
Other intentional injuries	Included: Y87[*]

[*] Injuries of undetermined intent. ICD-10 codes for injuries of undetermined intent were included in the corresponding unintentional injury category. The exception to this rule was Y87 (sequelae of intentional self-harm, assault and events of undetermined intent), which was classified as an intentional injury.
[†] Y19 (poisoning by and exposure to other and unspecified chemicals and noxious substances, undetermined intent) and Y26 (exposure to smoke, fire and flames, undetermined intent) were categorised as 'other unintentional injuries' due to the inability to distinguish between whether these were 'self-inflicted injuries' versus 'poisoning' or 'fire' events.
[‡] Healthcare accidents.

APPENDIX C: THE EFFECT OF USING ALTERNATIVE INJURY AAFS CALCULATED BY THE GLOBAL BURDEN OF DISEASE 2010 RISK FACTORS COLLABORATING GROUP: A SENSITIVITY ANALYSIS.

The Global Burden of Disease (GBD) 2010 Risk Factors Collaborating Group used New Zealand average alcohol consumption data and drinking pattern estimates to calculate injury AAFs by age/sex/ethnicity subgroup. Since the GBD modelling methods did not appear robust to the extreme drinking patterns in the younger New Zealand age categories, the GBD injury AAFs were not used in our main analysis (please see 'AAFs for partially alcohol-attributable injuries' on page 39 for the detailed rationale behind this decision).

This appendix outlines the methods and data used to calculate the GBD injury AAFs and demonstrates the effect of using these GBD injury AAFs to recalculate the 2004 alcohol-attributable mortality and DALY results.

INJURY SENSITIVITY ANALYSIS METHODS: ALCOHOL CONSUMPTION DATA

The GBD injury AAF calculations incorporated several pieces of information about both average alcohol consumption and drinking patterns in New Zealanders, with the same definitions used for both women and men. The data used to calculate the GBD injury AAFs included:
Current drinkers (i.e. people who had consumed alcohol during the previous year).

1. Prevalence (denominator = drinkers & non-drinkers).
2. Average alcohol consumption (grams of pure alcohol per day; denominator = current drinkers).

People with heavy drinking occasions (HDOs) (i.e. people who consumed 60+ grams of alcohol on one occasion at least monthly; includes people with *irregular* and *regular* HDOs).

1. Prevalence (denominator = drinkers & non-drinkers).
2. Average number of HDOs per week (denominator = people with HDOs).
3. Average number of drinks per HDO (denominator = people with HDOs).

Please see Table C-1 and Table C-2 for these 2004 average alcohol consumption and drinking pattern estimates by age/sex/ethnicity subgroup (used to calculate AAFs for estimating alcohol-attributable mortality). Table C-3 presents the estimates by age/sex subgroup (used to calculate AAFs for estimating alcohol-attributable DALYs).

PREVALENCE OF PEOPLE WITH HEAVY DRINKING OCCASIONS

People with heavy drinking occasions (HDOs) were defined as people who consumed 60+ grams of alcohol on one occasion *at least monthly,* therefore including both people with *irregular* and

regular HDOs. We used the same data sources and older age extrapolation methods as described in the 'Prevalence of people with irregular heavy drinking occasions' section (see page 30). To calculate the prevalence of people with HDOs for each age/sex/ethnicity subgroup, we summed the prevalence of people with *irregular* HDOs (categories Ib, IIb and IIIb in Table 12) with the prevalence of people with *regular* HDOs (category IV in Table 12). This resulted in prevalence estimates with denominators that included both drinkers and non-drinkers.

AVERAGE NUMBER OF HEAVY DRINKING OCCASIONS PER WEEK

The average number of heavy (60+ g) drinking occasions per week were calculated by age/sex/ethnicity subgroups using data from all people with heavy drinking occasions (i.e. people who consumed 60+ grams of alcohol on one occasion *at least monthly*).

We planned to use the same data sources for calculating these drinking pattern estimates as we did for the average daily alcohol consumption estimates. The drinking pattern data were available from the 2003/04 Health Behaviours Survey – Alcohol Use (HBS2003/04), so the 2004 drinking pattern estimates for the 15–59 year age categories were calculated from this source. However, the Ministry of Health could not provide these data from the 2007/08 New Zealand Alcohol and Drug Use Survey (NZADUS2007/08), so we used SHORE's Harm to Others Survey (HtO2008/09) for 2007 drinking pattern estimates for the 15–59 year age categories as it was the best available alternative.

Drinking pattern estimates for both older age categories (i.e. 60–69 and 70–79 years) were calculated using the same extrapolation methods as previously described for average daily alcohol consumption estimates (see page 26), with two exceptions: (1) weighted estimates from HBS2003/04 and HtO2008/09 were included in the calculations since we were unable to obtain the required data from NZADUS2007/08; and (2) 70–79 year old HtO2008/09 estimates were not used in the calculations, due to the prohibitively small sample sizes of people with heavy drinking occasions in this age group. As previously mentioned in the 'Alcohol consumption estimates for older age categories' section (see page 26), there is a large degree of uncertainty in the estimates for older age categories, and this is even more so for the drinking pattern estimates where only people with heavy drinking occasions were included.

AVERAGE NUMBER OF DRINKS PER HEAVY DRINKING OCCASION

NZADUS2007/08 did not have data available regarding the quantity of drinks per heavy drinking occasion, so these drinking pattern estimates were calculated for each age/sex/ethnicity subgroup using identical data sources and methods as described above for the 'average number of heavy drinking occasions per week' estimates. As a result, the extrapolated older age estimates for 'average number of drinks per heavy drinking occasion' also share the limitations discussed in the previous section (i.e. high levels of uncertainty).

Table C-1: New Zealand alcohol consumption estimates used for the calculation of GBD injury AAFs, by age and ethnicity (2004 males).

		Age group (years)				
	Alcohol consumption estimates*	**15–29**	**30–44**	**45–59**	**60–69†**	**70–79†**
Māori males	***Average consumption***					
	Prevalence of current drinkers	85.6%	83.2%	75.7%	76.8%	77.2%
	Average daily alcohol consumption	63.0	28.0	21.0	15.5	9.7
	Pattern of drinking					
	Prevalence of people with HDOs§	57.4%	36.2%	22.3%	15.8%	10.4%
	Average number of HDOs per week**	2.6	1.8	1.7	2.1	2.8
	Average number of drinks per HDO**	14.4	11.6	10.6	10.2	9.7
Non-Māori males	***Average consumption***					
	Prevalence of current drinkers	87.0%	90.1%	87.0%	85.8%	83.0%
	Average daily alcohol consumption	48.0	24.0	22.0	21.0	18.5
	Pattern of drinking					
	Prevalence of people with HDOs§	41.8%	18.8%	12.5%	10.3%	6.8%
	Average number of HDOs per week**	2.7	1.8	2.1	2.5	3.1
	Average number of drinks per HDO**	12.5	9.9	9.0	8.9	8.4

* HDO = heavy drinking occasion (60+ grams in one occasion). Prevalence calculations included drinkers and non-drinkers in the denominator.
† Extrapolated estimates for older age categories have a high degree of uncertainty, particularly for the average 'pattern of drinking' estimates.
‡ For all current drinkers.
§ People with HDOs = people who have heavy drinking occasions *at least monthly* (*including daily*).
** Calculations of averages only included people with heavy drinking patterns.

Table C-2: New Zealand alcohol consumption estimates used for the calculation of GBD injury AAFs, by age and ethnicity (2004 females).

		Age group (years)				
	Alcohol consumption estimates*	**15–29**	**30–44**	**45–59**	**60–69†**	**70–79†**
Māori females	***Average consumption***					
	Prevalence of current drinkers	84.2%	73.5%	67.3%	57.7%	44.3%
	Average daily alcohol	34.0	16.0	13.0	6.2	2.7
	Pattern of drinking					
	Prevalence of people with HDOs§	41.7%	20.7%	10.2%	3.2%	0.2%
	Average number of HDOs per week**	1.6	1.0	1.1	0.6	0.0
	Average number of drinks per HDO**	12.7	10.8	10.8	9.1	8.3
Non-Māori females	***Average consumption***					
	Prevalence of current drinkers	83.3%	86.0%	84.0%	75.8%	68.2%
	Average daily alcohol	18.0	12.0	12.0	8.9	7.8
	Pattern of drinking					
	Prevalence of people with HDOs§	18.2%	7.0%	2.5%	2.0%	0.6%
	Average number of HDOs per week**	1.5	1.3	1.3	1.2	0.4
	Average number of drinks per HDO**	9.1	8.4	10.1	7.6	7.1

* HDO = heavy drinking occasion (60+ grams in one occasion). Prevalence calculations included drinkers and non-drinkers in the denominator.
† Extrapolated estimates for older age categories have a high degree of uncertainty, particularly for the average 'pattern of drinking' estimates.
‡ For all current drinkers.
§ People with HDOs = people who have heavy drinking occasions *at least monthly* (*including daily*).
** Calculations of averages only included people with heavy drinking patterns.

Table C-3: New Zealand alcohol consumption estimates used for calculation of GBD injury AAFs, by age (2004 males and females).

		Age group (years)				
	Alcohol consumption estimates*	**15–29**	**30–44**	**45–59**	**60–69†**	**70–79†**
Males	***Average consumption***					
	Prevalence of current drinkers	86.8%	89.2%	85.9%	85.2%	82.8%
	Average daily alcohol	50.7	24.5	21.9	20.6	18.1
	Pattern of drinking					
	Prevalence of people with HDOs§	44.6%	21.2%	13.4%	10.7%	6.9%
	Average number of HDOs per week**	2.7	1.8	2.1	2.4	3.1
	Average number of drinks per HDO**	12.8	10.1	9.2	9.0	8.5
Females	***Average consumption***					
	Prevalence of current drinkers	83.5%	84.2%	82.3%	74.4%	67.1%
	Average daily alcohol	21.0	12.6	12.1	8.7	7.5
	Pattern of drinking					
	Prevalence of people with HDOs§	22.6%	8.9%	3.2%	2.1%	0.5%
	Average number of HDOs per week**	1.5	1.3	1.3	1.2	0.4
	Average number of drinks per HDO**	9.8	8.7	10.2	7.8	7.2

* HDO = heavy drinking occasion (60+ grams in one occasion). Prevalence calculations included drinkers and non-drinkers in the denominator.
† Extrapolated estimates for older age categories have a high degree of uncertainty, particularly for the average 'pattern of drinking' estimates.
‡ For all current drinkers.
§ People with HDOs = people who have heavy drinking occasions *at least monthly (including daily)*.
** Calculations of averages only included people with heavy drinking patterns.

Injury sensitivity analysis methods: Alcohol-attributable fraction (AAF) calculations

The injury AAFs used in this sensitivity analysis were calculated by members of the Global Burden of Disease (GBD) 2010 Risk Factors Collaborating Group,[a] who have recently developed new methods for modelling injury AAFs from average alcohol consumption and drinking pattern characteristics for a given population.[60] New Zealand AAFs were calculated by age/sex/ethnicity subgroup for three types of injury:

1. Road traffic injuries (RTIs).
2. Non-road traffic injuries (non-RTIs), a broad injury group that includes:
    a. unintentional injuries (i.e. non-alcohol poisonings, falls, fires, drownings, and other unintentional injuries)
    b. intentional injuries (i.e. self-inflicted injuries and other intentional injuries).
3. Assault.

Since the GBD 2010 Risk Factors Assessment for alcohol did not calculate AAFs for children (0–14 years old) for road traffic injuries, fire injuries or other unintentional injuries, for these injury categories we used the same child AAFs as in our main analysis (for more information please see the 'Injury AAFs for children on page 40).

Estimating AAFs for road traffic injuries and non-road traffic injuries

The AAFs for RTIs and non-RTIs were modelled according to methodology which takes into account two dimensions of alcohol consumption:

1. Heavy drinking patterns (both the number of heavy drinking occasions and the amount consumed per heavy drinking occasion).
2. Average daily alcohol consumption (on days without heavy drinking occasions).

When calculating the AAFs, alcohol metabolism rates for men and women were also included to calculate a person's time at risk of an injury outcome, according to methods outlined by Taylor and colleagues.[9] The AAFs for injuries attributable to alcohol consumption were calculated as follows:

$$AAF = \frac{P_{abs} + P_{drinkers\ (without\ HDOs)}\ RR_{drinkers\ (without\ HDOs)} + P_{drinkers\ (with\ HDOs)}\ RR_{drinkers\ (with\ HDOs)} - 1}{P_{abs} + P_{drinkers\ (without\ HDOs)}\ RR_{drinkers\ (without\ HDOs)} + P_{drinkers\ (with\ HDOs)}\ RR_{drinkers\ (with\ HDOs)}}$$

where,

P_{abs} = prevalence of current abstainers
$P_{drinkers(without\ HDOs)}$ = prevalence of current drinkers without heavy drinking occasions
$P_{drinkers(with\ HDOs)}$ = prevalence of current drinkers with heavy drinking occasions

People with heavy drinking occasions (HDOs) were defined as people who consumed 60+ grams of alcohol on one occasion *at least monthly*.

[a] Jürgen Rehm, Kevin Shield and Benjamin Taylor.

The injury relative risks (RRs) were calculated separately for:

1. Current drinkers without heavy drinking occasions ($RR_{drinkers(without\ HDOs)}$).
2. Current drinkers with heavy drinking occasions ($RR_{drinkers(with\ HDOs)}$).

$RR_{drinkers(without\ HDOs)}$ was calculated as follows:

$$RR_{drinkers\ (without\ HDOs)} = (RR_{nonHDOdays} - 1) * P_{nonHDOdays} + 1$$

and $RR_{drinkers(with\ HDOs)}$ was calculated as follows:

$$RR_{drinkers\ (with\ HDOs)} = (RR_{nonHDOdays} - 1) * P_{nonHDOdays} + (RR_{HDOdays} - 1) * P_{HDOdays} + 1$$

where injury risk on average drinking days ($RR_{nonHDOdays}$) was calculated as follows:

$$RR_{nonHDOdays} = P_{day\ at\ risk}(x_{nonHDOdays}) * (RR_{injury}(x_{nonHDOdays}) - 1) + 1$$

and where injury risk on days with heavy drinking occasions ($RR_{HDOdays}$) was calculated as follows:

$$RR_{HDOdays} = P_{dayatrisk}(x_{HDOdays}) * (RR_{injury}(x_{HDOdays}) - 1) + 1$$

where,

$P_{nonHDOdays}$ = proportion of drinking days without a heavy drinking occasion
$P_{HDOdays}$ = proportion of drinking days with a heavy drinking occasion
$x_{nonHDOdays}$ = average daily alcohol consumption on days without a heavy drinking occasion
$x_{HDOdays}$ = average daily alcohol consumption on days with a heavy drinking occasion
$P_{dayatrisk}$ = proportion of a day at risk

- calculated based on the average rate at which alcohol is metabolised, given the average daily alcohol consumption (x) on days with or without heavy drinking occasions
- corresponds to the time during which the blood alcohol level is sufficiently elevated to increase the risk of injury

RR_{injury} = RR function for injuries

- used to calculate the RR for both days with and without heavy drinking occasions, given the average daily alcohol consumption (x) on days with or without heavy drinking occasions
- different RR functions were used for RTIs and non-RTIs ([60])

Since these AAFs were calculated based on samples of emergency room patients, we estimated the AAF for mortality from non-road traffic injuries by multiplying the AAF for morbidity from non-road traffic injuries by 9/4.[17] These methods were based on two studies that compared blood alcohol levels of emergency room patients with blood alcohol levels obtained from coroners' reports of patients who died from an injury.[75,76]

For women, the AAF for road traffic injuries was calculated by multiplying the AAF for road traffic injuries for men by the product of the per capita consumption of alcohol for women divided by the per capita consumption of alcohol for men. This was done as the RR function for road traffic injuries was considered valid only for men.[77]

ESTIMATING AAFS FOR ASSAULT INJURIES

The AAFs for deaths and injuries caused by an assault by someone who has been drinking were calculated based on recent Australian data reported by Laslett *et al.* (2010).[78] AAFs for all age groups (including secondary effects of drinking resulting in assaults to 0–14 year olds) were calculated as follows:

$$AAF_{Assault\,age\_NZi} = AAF_{Assaultage\_Australia} * (AAF_{Assault\_NZ} / AAF_{Assault\_Australia})$$

where,

$AAF_{Assaultage\_NZi}$ = age-specific AAF for deaths or injuries caused by assault in New Zealand
$AAF_{Assaultage\_Australiai}$ = age-specific AAF for deaths or injuries caused by assault in Australia
$AAF_{Assault\_NZ}$ = AAF for deaths or injuries caused by assaults for the New Zealand population
$AAF_{Assault\_Australia}$ = AAF for deaths or injuries caused by assaults for the Australian population

Injury sensitivity analysis methods: Mortality and morbidity AAF estimates

As previously discussed with regard to the AAF estimates used in our main analysis, it is important to note that each of the point estimates presented in the following tables has an unquantified degree of uncertainty (see page 41 for previous discussion). This is an unavoidable methodological limitation common to all AAF estimates that has been discussed by the GBD 2010 Risk Factors Collaborating Group.[2]

The 2004 injury mortality AAFs used in our injury sensitivity analysis are presented by age/sex/ethnicity subgroup in Table C-4 (Māori AAFs) and Table C-5 (Non-Māori AAFs). 2004 injury morbidity AAFs are shown by age/sex subgroup in Table C-6.

Several AAF estimates for injuries in young adult males were implausibly high due to the GBD injury AAF modelling methods not functioning well at the high levels of alcohol consumption of young male New Zealanders. These AAFs were therefore capped at 60.0%, an adjustment that was based on expert opinion, and that has been used by the GBD 2010 Risk Factors Collaborating Group as an upper limit for injury AAFs.[60]

Table C-4: Injury sensitivity analysis: Māori mortality AAFs for injuries (2004).[*]

	Māori males							Māori females						
	0–4	5–14	15–29	30–44	45–59	60–69	70–79	0–4	5–14	15–29	30–44	45–59	60–69	70–79
Road traffic injuries	20.0%	20.0%	60.0%	60.0%	48.7%	38.0%	23.7%	20.0%	20.0%	45.6%	33.6%	24.9%	19.4%	12.1%
Alcohol poisonings	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Non-alcohol poisonings			60.0%	30.5%	13.9%	10.3%	9.0%			37.3%	12.8%	9.8%	1.6%	1.0%
Falls			60.0%	30.5%	13.9%	10.3%	9.0%			37.3%	12.8%	9.8%	1.6%	1.0%
Fires	24.0%	24.0%	60.0%	30.5%	13.9%	10.3%	9.0%	24.0%	24.0%	37.3%	12.8%	9.8%	1.6%	1.0%
Drownings			60.0%	30.5%	13.9%	10.3%	9.0%			37.3%	12.8%	9.8%	1.6%	1.0%
Other unintentional injuries	28.6%	28.6%	60.0%	30.5%	13.9%	10.3%	9.0%	8.7%	8.7%	37.3%	12.8%	9.8%	1.6%	1.0%
Self-inflicted injuries			60.0%	30.5%	13.9%	10.3%	9.0%			37.3%	12.8%	9.8%	1.6%	1.0%
Assault	14.0%	14.0%	22.9%	24.8%	20.1%	13.0%	11.3%	14.0%	14.0%	22.9%	24.8%	20.1%	13.0%	11.3%
Other intentional injuries			60.0%	30.5%	13.9%	10.3%	9.0%			37.3%	12.8%	9.8%	1.6%	1.0%

[*] These AAFs were used for calculating 2004 alcohol-attributable deaths and YLLs. AAF estimates for 60+ years have more uncertainty due to smaller sample sizes and the use of extrapolated alcohol consumption estimates.

Table C-5: Injury sensitivity analysis: Non-Māori mortality AAFs for injuries (2004).*

	Non-Māori males							Non-Māori females						
	0–4	5–14	15–29	30–44	45–59	60–69	70–79	0–4	5–14	15–29	30–44	45–59	60–69	70–79
Road traffic injuries	20.0%	20.0%	60.0%	42.1%	25.6%	25.2%	20.2%	20.0%	20.0%	34.8%	17.3%	10.5%	10.3%	8.3%
Alcohol poisonings	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Non-alcohol poisonings			60.0%	18.2%	15.0%	14.4%	13.6%			10.6%	6.0%	6.9%	3.4%	2.6%
Falls			60.0%	18.2%	15.0%	14.4%	13.6%			10.6%	6.0%	6.9%	3.4%	2.6%
Fires	24.0%	24.0%	60.0%	18.2%	15.0%	14.4%	13.6%	24.0%	24.0%	10.6%	6.0%	6.9%	3.4%	2.6%
Drownings			60.0%	18.2%	15.0%	14.4%	13.6%			10.6%	6.0%	6.9%	3.4%	2.6%
Other unintentional injuries	19.1%	19.1%	60.0%	18.2%	15.0%	14.4%	13.6%	5.8%	5.8%	10.6%	6.0%	6.9%	3.4%	2.6%
Self-inflicted injuries			60.0%	18.2%	15.0%	14.4%	13.6%			10.6%	6.0%	6.9%	3.4%	2.6%
Assault	14.0%	14.0%	22.9%	24.8%	20.1%	13.0%	11.3%	14.0%	14.0%	22.9%	24.8%	20.1%	13.0%	11.3%
Other intentional injuries			60.0%	18.2%	15.0%	14.4%	13.6%			10.6%	6.0%	6.9%	3.4%	2.6%

* These AAFs were used for calculating 2004 alcohol-attributable deaths and YLLs. AAF estimates for 60+ years have more uncertainty due to smaller sample sizes and the use of extrapolated alcohol consumption estimates.

Table C-6: Injury sensitivity analysis: Total New Zealand morbidity AAFs for injuries (2004).[*]

	Males							Females						
	0–4	5–14	15–29	30–44	45–59	60–69	70–79	0–4	5–14	15–29	30–44	45–59	60–69	70–79
Road traffic injuries	20.0%	20.0%	60.0%	47.5%	27.5%	26.0%	20.4%	20.0%	20.0%	36.6%	20.2%	11.7%	11.1%	8.7%
Non-alcohol poisonings[†]			26.7%	8.4%	6.6%	6.3%	5.9%			6.1%	2.8%	3.0%	1.4%	1.1%
Falls			26.7%	8.4%	6.6%	6.3%	5.9%			6.1%	2.8%	3.0%	1.4%	1.1%
Fires	10.7%	10.7%	26.7%	8.4%	6.6%	6.3%	5.9%	10.7%	10.7%	6.1%	2.8%	3.0%	1.4%	1.1%
Drownings			26.7%	8.4%	6.6%	6.3%	5.9%			6.1%	2.8%	3.0%	1.4%	1.1%
Other unintentional injuries	11.5%	10.1%	26.7%	8.4%	6.6%	6.3%	5.9%	2.9%	2.9%	6.1%	2.8%	3.0%	1.4%	1.1%
Self-inflicted injuries			26.7%	8.4%	6.6%	6.3%	5.9%			6.1%	2.8%	3.0%	1.4%	1.1%
Assault	6.2%	6.2%	10.2%	11.0%	8.9%	5.8%	5.0%	6.2%	6.2%	10.2%	11.0%	8.9%	5.8%	5.0%
Other intentional injuries			26.7%	8.4%	6.6%	6.3%	5.9%			6.1%	2.8%	3.0%	1.4%	1.1%

[*] These AAFs were used for calculating 2004 alcohol-attributable YLDs. AAF estimates for 60+ years have more uncertainty due to smaller sample sizes and the use of extrapolated alcohol consumption estimates.
[†] See 'Poisonings' section starting on page 63 for a detailed explanation of why we were unable to use 'alcohol poisonings' 100% AAFs for YLD calculations.

Injury sensitivity analysis methods: Alcohol-attributable mortality and DALY calculations

Except for substituting the GBD injury AAFs, we conducted this analysis exactly as for the main analysis. Please see the following main report sections for calculation details: 'Calculating alcohol-attributable deaths and years of life lost (YLLs)' starting on page 48; and 'Calculating alcohol-attributable disability-adjusted life years (DALYs)' starting on page 61).

Injury sensitivity analysis results: Alcohol-attributable mortality

When the GBD injury mortality AAFs in Tables C-4 and C-5 are used to calculate alcohol-attributable mortality in New Zealand, the proportion of all New Zealand deaths that were attributable to alcohol in 2004 increases to 5.6% (compared to 5.1% in the main analysis) and alcohol-attributable YLLs are responsible for 9.6% of all New Zealand YLLs (compared to 8.0% in the main analysis). Alcohol-attributable deaths due to injury (i.e. compared to cancers and other non-injury conditions) rise from 42.8% to 47.4% of all alcohol-attributable deaths (from 337 to 406 injury deaths), with a corresponding increase in the proportion of alcohol-attributable YLLs due to injury from 63.3% to 69.3% (from 8,610 to 11,267 injury YLLs). As a result of the high GBD AAF estimates for injuries in young male New Zealanders, most of the increase in alcohol-attributable injury mortality occurs in young adult males due to alcohol-attributable deaths from road traffic injuries and self-inflicted injuries.

Compared to the main analysis, the injury sensitivity analysis shows a marked increase in male alcohol-attributable deaths and a slight decrease in female alcohol-attributable deaths: total alcohol-attributable injury deaths in men increase by 28% (from 270 to 345 injury deaths) and decrease by 9% in women (from 67 to 61 injury deaths). In terms of the proportion of all 2004 New Zealand deaths that were attributable to alcohol, this translates into an increase from 5.8% to 6.7% for men and very little change for women (from 4.2% to 4.1%).

When the ages at death are taken into account by calculating years of life lost (YLLs) due to injuries, men lose an additional 2,637 years of life compared to the main analysis (from 6,912 to 9,549 injury YLLs), while female YLLs are very similar for the sensitivity and main analyses (1,719 and 1,699 injury YLLs, respectively). When the GBD injury AAFs are used, the proportion of all 2004 YLLs due to alcohol increases from 9.6% to 12.3% in men, while the proportion remains the same in women (5.8%).

Using the GBD injury AAFs did not have a large effect on the rankings of specific causes of alcohol-attributable deaths and YLLs for males or females (see Tables C-7 and **Error! Reference source not found.**). However, the proportions in these tables demonstrate how the use of GBD injury AAFs resulted in a much larger contribution of self-inflicted injuries to the alcohol-attributable mortality burden in New Zealand males, with self-inflicted injuries now accounting for 19.8% of alcohol-attributable male deaths (compared to 11.0% in main analysis) and 27.8% of alcohol-attributable male YLLs (15.3% in main analysis).

Table C-7: Injury sensitivity analysis: Top five causes of alcohol-attributable (AA) deaths, by sex (0–79 years; 2004).

Males	% of AA deaths (N = 596)	Females	% of AA deaths (N = 259)
Road traffic injuries	23.2%	Female breast cancer	25.7%
Self-inflicted injuries	19.8%	Road traffic injuries	13.4%
Alcoholic liver cirrhosis	9.4%	Haemorrhagic stroke	12.3%
Haemorrhagic stroke	5.2%	Alcoholic liver cirrhosis	9.3%
Oesophagus cancer	4.8%	Colon cancer	6.7%

Table C-8: Injury sensitivity analysis: Top five causes of alcohol-attributable years of life lost (AA YLLs), by sex (0–79 years;2004).

Males	% of AA YLLs (N = 12172)	Females	% of AA YLLs (N = 4090)
Road traffic injuries	32.0%	Road traffic injuries	24.9%
Self-inflicted injuries	27.8%	Female breast cancer	21.8%
Other unintentional injuries	6.0%	Self-inflicted injuries	8.9%
Alcoholic liver cirrhosis	5.2%	Alcoholic liver cirrhosis	8.5%
Falls	3.6%	Haemorrhagic stroke	6.7%

Table shows the changes in death results by sex/ethnicity subgroups when the GBD injury AAFs were used in the sensitivity analysis, with notable increases in alcohol-attributable deaths occurring in both Māori and non-Māori males.

Table C-9: Comparison of injury sensitivity analysis and main analysis: Total alcohol-attributable deaths, by sex and ethnicity (0–79 years; 2004).

	Ethnicity	Deaths caused (count)	*(results from main analysis)*	% of all deaths	*(results from main analysis)*	Deaths caused (rate*)	*(results from main analysis)*
Males	Māori	138	*(125)*	10.1%	*(9.1%)*	55.0	*(50.7)*
	Non-Māori	458	*(396)*	6.1%	*(5.2%)*	23.6	*(19.0)*
	Total	596	*(521)*	6.7%	*(5.8%)*	27.6	*(23.0)*
Females	Māori	64	*(61)*	6.1%	*(5.8%)*	24.7	*(23.9)*
	Non-Māori	195	*(204)*	3.7%	*(3.8%)*	8.2	*(8.6)*
	Total	259	*(265)*	4.1%	*(4.2%)*	10.1	*(10.2)*
Total	Māori	203	*(186)*	8.4%	*(7.7%)*	39.3	*(36.8)*
	Non-Māori	653	*(601)*	5.1%	*(4.7%)*	15.8	*(13.7)*
	Total	856	*(787)*	5.6%	*(5.1%)*	18.7	*(16.5)*

* Rate per 100,000 age-standardised to WHO world population

Table provides details about the alcohol-attributable deaths for each sex/ethnicity subgroup by specific injury categories. Comparing these numbers to the equivalent numbers in the main analysis (Table I-7 on page 156) shows how the use of GBD injury AAFs changes the numbers of alcohol-attributable deaths in several injury categories. In particular, there are more alcohol-attributable deaths due to self-inflicted injuries in males (34 Māori and 84 non-Māori male deaths compared to 14 and 43 deaths in the main analysis, respectively), and road traffic injuries in non-Māori males (94 deaths compared to 64 in the main analysis).

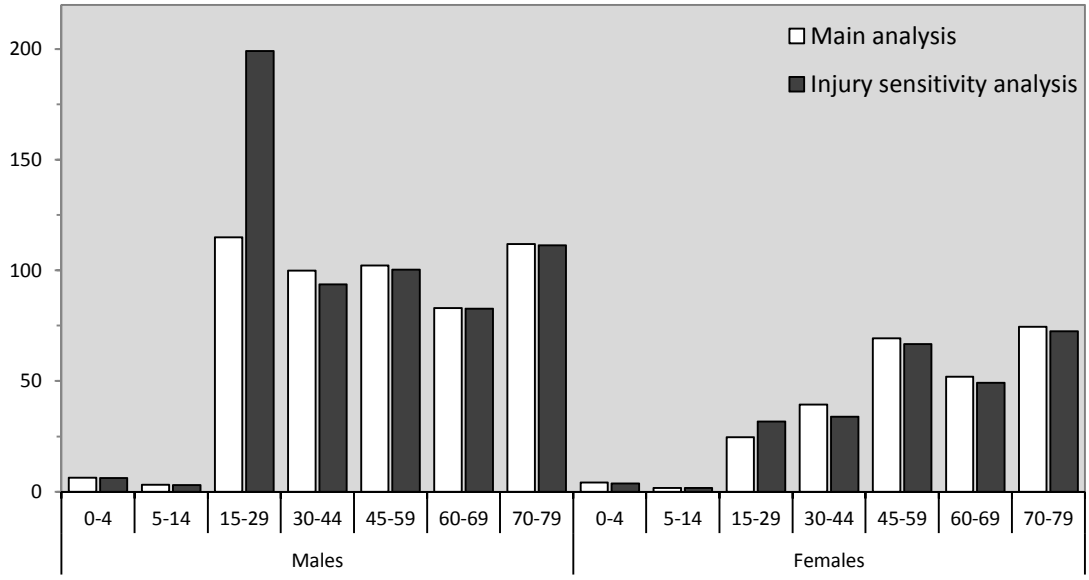
Table C-10: Injury sensitivity analysis: Number of alcohol-attributable deaths for each injury category (0–79 years; 2004).

	Māori			Non-Māori			Total		
	Males	Females	All	Males	Females	All	Males	Females	All
Unintentional injuries									
Road traffic injuries	45	13	58	94	22	115	139	35	173
Alcohol poisonings	1	1	2	4	3	7	5	4	9
Non-alcohol poisonings	4	1	5	7	1	8	11	2	13
Falls	3	0	3	17	1	18	20	1	21
Fires	1	0	2	1	0	2	3	1	3
Drownings	3	0	3	10	0	10	13	0	14
Other unintentional injuries	9	1	10	20	2	21	28	3	31
Intentional injuries									
Self-inflicted injuries	34	7	41	84	6	89	118	12	130
Assault	3	1	4	4	2	6	7	3	10
Other intentional injuries	1	0	1	1	0	1	1	0	1

Figure C- shows how most of the increased injury mortality seen in this sensitivity analysis occurs in 15–29 year old New Zealand males, with a total of 199 alcohol-attributable deaths (193 due to injuries) in 15–29 year old males when using the GBD injury AAFs compared to a total of 115 alcohol-attributable deaths (109 due to injuries) using the AAFs from our main analysis.

The age-specific rankings shown in Table C-11 further illustrate how the use of GBD injury AAFs impacted the relative contributions of specific condition and injury categories to the overall numbers of alcohol-attributable deaths in each age/sex subgroup. The proportion of self-inflicted injuries increased for most age/sex subgroups, with 15–29 year old males showing the most marked increases, climbing from 19.8% of all alcohol-attributable deaths in the main analysis to 38.3% in the sensitivity analysis (see Table 50 on page 87 for the main analysis ranking results by age/sex subgroup).

Figure C-1: Comparison of injury sensitivity analysis and main analysis. Number of deaths attributable to alcohol consumption, by age and sex (2004).



TableC-11: Injury sensitivity analysis: Top five causes of alcohol-attributable (AA) deaths in 15–59 year olds, by sex (2004).

Males	% of AA deaths	Females	% of AA deaths
15-29 years	**(N = 199)**	**15-29 years**	**(N = 32)**
Road traffic injuries	39.2%	Road traffic injuries	60.1%
Self-inflicted injuries	38.3%	Self-inflicted injuries	23.8%
Other unintentional injuries	5.1%	Non-alcohol poisonings	3.4%
Falls	4.2%	Alcohol poisonings	3.2%
Drownings	4.2%	Epilepsy	2.5%
30-44 years	**(N = 94)**	**30-44 years**	**(N = 34)**
Road traffic injuries	35.1%	Female breast cancer	30.1%
Self-inflicted injuries	26.5%	Road traffic injuries	24.0%
Other unintentional injuries	7.5%	Alcoholic liver cirrhosis	11.8%
Alcoholic liver cirrhosis	4.3%	Self-inflicted injuries	7.8%
Falls	3.5%	Alcohol use disorders	5.9%
45-59 years	**(N = 100)**	**45-59 years**	**(N = 67)**
Alcoholic liver cirrhosis	16.9%	Female breast cancer	34.1%
Road traffic injuries	16.6%	Alcoholic liver cirrhosis	16.5%
Self-inflicted injuries	10.6%	Alcohol use disorders	9.0%
Mouth and oropharyngeal cancers	9.8%	Haemorrhagic stroke	7.7%
Oesophagus cancer	7.3%	Colon cancer	4.9%

Injury sensitivity analysis results: Alcohol-attributable DALYs

When the GBD injury mortality and morbidity AAFs (Tables C-4 – C-6) are used to calculate alcohol-attributable DALYs lost in New Zealand during 2004, the proportion of all New Zealand DALYs that are attributable to alcohol in 2004 increases to 7.1% (compared to 6.5% in the main analysis). Alcohol-attributable DALYs lost due to injury (i.e. compared to cancers and other non-injury conditions) rise from 35.5% to 41.2% of all alcohol-attributable DALYs lost.

Compared to the main analysis, the injury sensitivity analysis shows a 15% increase in total male alcohol-attributable DALYs lost, while total female DALYs decrease by less than 1% (see Table).

Table C-12: Comparison of injury sensitivity analysis and main analysis. Alcohol-attributable (AA) DALYs lost, by sex (0–79 years; 2004).

	AA DALYs lost (count)	*(results from main analysis)*	% of all DALYs lost	*(results from main analysis)*	AA DALYs lost (rate*)	*(results from main analysis)*
Males	21,636	*(18,803)*	10.2%	*(8.8%)*	1108	*(933)*
Females	9,515	*(9,601)*	4.2%	*(4.3%)*	435	*(435)*
Total	31,151	*(28,403)*	7.1%	*(6.5%)*	767	*(680)*

* Rate per 100,000 age-standardised to WHO world population

Table C-13 shows how the alcohol-attributable DALYs are distributed in the unintentional and intentional injury categories for the sensitivity and main analyses. Table C-13 also demonstrates how the use of GBD injury AAFs impacts the relative contributions of condition and injury categories to the overall male and female DALY burdens. Similar to the mortality analysis, the major differences occur in males. The GBD injury AAFs double the number of male DALYs due to intentional injuries, resulting in an increased proportion of all alcohol-attributable male DALYs due to intentional injuries from 9.7% to 16.8%.

Table C-13: Comparison of injury sensitivity analysis and main analysis. Alcohol-attributable DALYs lost, by cause categories (0–79 years; 2004).

	Males				Females			
	DALYs lost	*(results from main analysis)*	% of AA DALYs	*(results from main analysis)*	DALYs lost	*(results from main analysis)*	% of AA DALYs	*(results from main analysis)*
Cancers	1114	*(1114)*	5.1%	*(5.9%)*	1680	*(1680)*	17.7%	*(17.5%)*
Neuro-psychiatric disorders	8392	*(8392)*	38.8%	*(44.6%)*	4933	*(4933)*	51.8%	*(51.4%)*
Cardiovascular disorders	435	*(435)*	2.0%	*(2.3%)*	358	*(358)*	3.8%	*(3.7%)*
Digestive disorders	713	*(713)*	3.3%	*(3.8%)*	412	*(412)*	4.3%	*(4.3%)*
Other conditions	177	*(177)*	0.8%	*(0.9%)*	109	*(109)*	1.1%	*(1.1%)*
Unintentional injuries	7168	*(6157)*	33.1%	*(32.7%)*	1577	*(1700)*	16.6%	*(17.7%)*
Intentional injuries	3637	*(1815)*	16.8%	*(9.7%)*	447	*(409)*	4.7%	*(4.3%)*
Totals	21636	*(18803)*	100.0%	*(100.0%)*	9515	*(9601)*	100.0%	*(100.0%)*

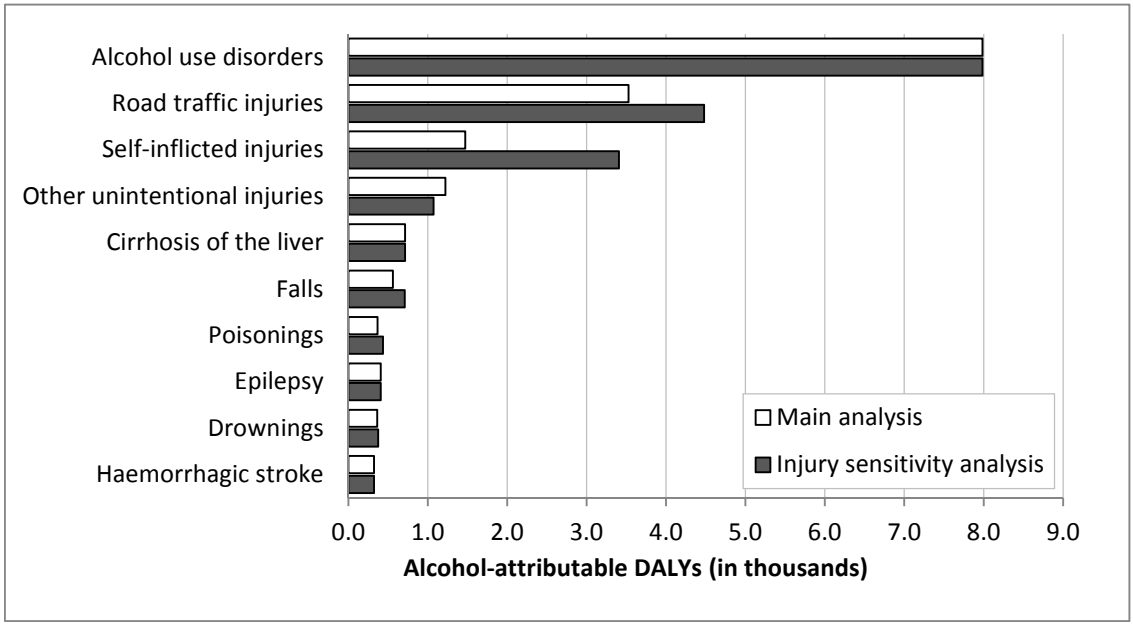
Table C-14 demonstrates how the use of GBD injury AAFs changes the numbers of alcohol-attributable DALYs by specific injury category.

Table C-14: Comparison of injury sensitivity analysis and main analysis. Alcohol-attributable DALYs lost, by specific injury categories (0–79 years; 2004).

	Males		Females		Total	
	DALYs lost (count)	*(results from main analysis)*	DALYs lost (count)	*(results from main analysis)*	DALYs lost (count)	*(results from main analysis)*
Unintentional injuries						
Road traffic injuries	4478	*(3526)*	1201	*(989)*	5679	*(4515)*
Poisonings	436	*(367)*	149	*(204)*	585	*(572)*
Falls	708	*(559)*	45	*(85)*	754	*(644)*
Fires	95	*(117)*	23	*(34)*	118	*(152)*
Drownings	377	*(364)*	12	*(48)*	389	*(412)*
Other unintentional injuries	1074	*(1223)*	147	*(340)*	1221	*(1563)*
Intentional injuries						
Self-inflicted injuries	3408	*(1473)*	371	*(297)*	3780	*(1770)*
Assault	187	*(322)*	75	*(108)*	261	*(430)*
Other intentional injuries	42	*(21)*	1	*(4)*	43	*(25)*

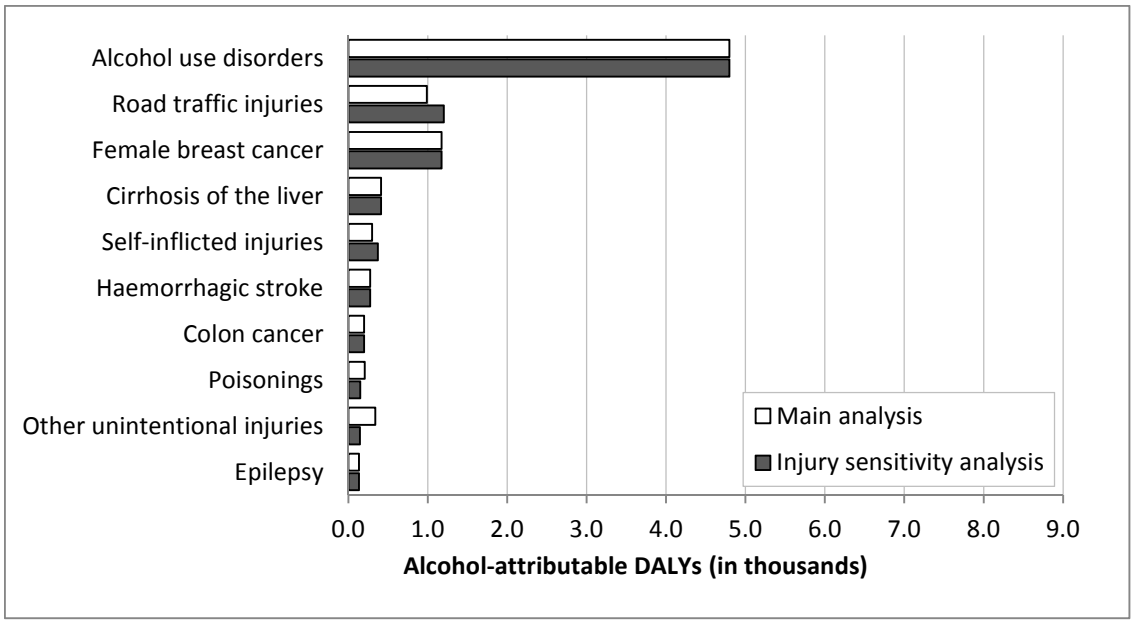
In men, using the GBD injury AAFs has a minimal impact on the ranking order of the leading causes of alcohol-attributable DALYs (only poisonings and epilepsy switch positions). Despite the similar ranking results, Figure shows that the sensitivity analysis does result in notable increases in alcohol-attributable male DALYs due to road traffic injuries and self-inflicted injuries.

Figure C-2: Comparison of injury sensitivity analysis and main analysis. Males: 10 specific leading causes of DALYs lost due to alcohol consumption (0–79 years; 2004).



On the other hand, while using the GBD injury AAFs for women results in several ranking changes (e.g. within the top five leading causes, female breast cancer moves from 2nd to 3rd; road traffic injuries move from 3rd to 2nd; self-inflicted injuries move from 6th to 5th; and other unintentional injuries move from 5th to 9th), these ranking changes are due to relatively small changes in DALY numbers (see Figure).

Figure C-3: Comparison of injury sensitivity analysis and main analysis. Females: 10 specific leading causes of DALYs lost due to alcohol consumption (0–79 years; 2004).



The age-specific rankings shown in Table C-15 further illustrate the impact of using GBD injury AAFs by age/sex subgroup. As seen in the mortality analysis, the main effects occur in the youngest (15–29 year old) age category. Compared to the main analysis, the proportion of self-inflicted injuries doubles in 15–29 year old males and increases from 11.1% to 17.2% in females of the same age category (see Table 56 on page 96 for corresponding main analysis results). The proportion of alcohol-attributable DALYs due to road traffic injuries in 15–29 year old males decreases from 49.2% to 38.8%, while its relative contribution increases from 43.9% to 50.4% in females.

Table C-15: Injury sensitivity analysis: Top five causes of alcohol-attributable disability-adjusted life years (AA DALYs) in 15–59 year olds, by sex (2004).

Males	% of AA DALYs	Females	% of AA DALYs
15-29 years	**(N = 7898)**	**15-29 years**	**(N = 1548)**
Road traffic injuries	38.8%	Road traffic injuries	50.4%
Self-inflicted injuries	32.4%	Self-inflicted injuries	17.2%
Other unintentional injuries	6.9%	Alcohol use disorders	13.6%
Falls	6.3%	Poisonings	4.8%
Drownings	3.6%	Epilepsy	4.5%
30-44 years	**(N = 6416)**	**30-44 years**	**(N = 2920)**
Alcohol use disorders	59.5%	Alcohol use disorders	65.4%
Road traffic injuries	14.3%	Female breast cancer	12.4%
Self-inflicted injuries	9.8%	Road traffic injuries	8.2%
Other unintentional injuries	3.3%	Cirrhosis of the liver	4.1%
Cirrhosis of the liver	1.9%	Self-inflicted injuries	2.4%
45-59 years	**(N = 4761)**	**45-59 years**	**(N = 3230)**
Alcohol use disorders	64.6%	Alcohol use disorders	64.3%
Cirrhosis of the liver	6.6%	Female breast cancer	14.7%
Road traffic injuries	6.2%	Cirrhosis of the liver	6.3%
Self-inflicted injuries	3.7%	Haemorrhagic stroke	2.5%
Mouth and oropharyngeal cancers	3.4%	Colon cancer	1.9%

APPENDIX D: SAMPLE SIZES AND RESPONSE RATES FOR SURVEYS WITH INFORMATION ABOUT DRINKING DURING PREGNANCY.

	Sample size (currently or previously pregnant women)	**Response rate** (overall survey)
2007/08 New Zealand Alcohol and Drug Use Survey (NZADUS2007/08)[25]	948	60%
2005 Alcohol in Pregnancy Study[32]	552	65%
2003/04 Health Behaviours Survey (HBS2003/04)[20]	138	59%
2006 Taranaki hospital study[33]	100	90%

APPENDIX E: ESTIMATES USED TO CALCULATE THE ALCOHOL-ATTRIBUTABLE FRACTIONS FOR ISCHAEMIC HEART DISEASE BY NEW ZEALAND AGE/SEX/ETHNICITY SUBGROUP.

Table E-1: People with irregular heavy drinking occasions (HDOs) in meta-analysis studies, pooled results by sex.

	Males	Females
Proportion of people with irregular HDOs*	15.7%	1.4%
Number of meta-analysis[37] studies	5	3
Number of drinkers†	73882	29328

* People with *irregular* HDOs were people who drank 60+ grams of pure alcohol per occasion *at least monthly, but not daily*.
† All mild to moderate drinkers (0.01–59.99 g/day) were included in proportion calculations.

Table E-2: Overall proportions of people with irregular heavy drinking occasions (HDOs)* in New Zealand sex/ethnicity subgroups, 2004 and 2007.

	Males	Females
2004 (HBS2003/04 estimates)		
Māori	38.3%	26.4%
Non-Māori	15.0%	6.3%
2007 (NZADUS2007/08 estimates)		
Māori	34.0%	30.9%†
Non-Māori	17.2%	14.8%†

* People with *irregular* HDOs were people who drank 60+ grams of pure alcohol per occasion *at least monthly, but not daily.*
† 2007 female estimates used a lower cutoff to define HDOs (40+ grams).

Table E-3. New Zealand age/ethnicity subgroup alcohol consumption prevalences (%), with excess proportions of people with irregular heavy drinking occasions (HDOs) extracted for application of ischaemic heart disease RRs; 2004 males.

	Alcohol consumption category	RR	Age group (years)*				
			15–29†	30–44†	45–59†	60–69‡	70–79‡
2004 Māori males	Abstainers	1.000	10.1	4.8	5.5	3.0	2.5
	Ex-drinkers	1.210	4.3	12.1	18.9	20.1	20.3
	0.01 – 19.99 g/day	0.863	34.5	47.0	50.7	54.5	59.7
	20.00 – 39.99 g/day	0.791	11.6	14.7	10.6	9.4	8.3
	40.00 – 59.99 g/day	0.879	7.9	5.6	4.6	3.3	2.1
	60+ g/day	0.765	24.0	9.9	6.2	7.9	6.2
	Excess people with irregular HDOs§	1.000	7.5	5.9	3.6	1.8	1.0
2004 Non-Māori males	Abstainers	1.000	10.2	4.9	5.4	5.5	7.2
	Ex-drinkers	1.210	2.8	5.0	7.7	8.7	9.7
	0.01 – 19.99 g/day	0.863	42.9	55.6	56.8	57.0	57.9
	20.00 – 39.99 g/day	0.791	15.6	20.3	16.4	17.0	15.2
	40.00 – 59.99 g/day	0.879	8.5	7.9	6.5	6.2	5.6
	60+ g/day	0.765	20.1	6.4	7.2	5.6	4.3
	Excess people with irregular HDOs§	1.000	0.0	0.0	0.0	0.0	0.0

* Sums of age/sex/ethnicity subgroup proportions may not equal exactly 100% due to rounding.
† Estimates from HBS2003/04.
‡ Extrapolated estimates from weighted averages of proportions from HBS2003/04, NZADUS2007/08 and HtO2008/09 surveys. See report section: 'Alcohol consumption estimates for older age categories' for details about calculation methods and limitations of extrapolated estimates (i.e. high degree of uncertainty).
§ Excess proportions of people with irregular HDOs extracted from alcohol consumption categories I, II and III (relative to meta-analysis[37] proportions provided by Roerecke and Rehm).

Table E-4. New Zealand age/ethnicity subgroup alcohol consumption prevalences (%), with excess proportions of people with irregular heavy drinking occasions (HDOs) extracted for application of ischaemic heart disease RRs; 2004 females.

	Alcohol consumption category	RR	Age group (years)*				
			15–29†	30–44†	45–59†	60–69‡	70–79‡
2004 Māori females	Abstainers	1.000	8.2	8.8	13.6	11.3	11.3
	Ex-drinkers	1.390	7.7	17.7	19.2	31.0	44.4
	0.01 – 19.99 g/day	0.884	48.9	55.8	54.3	49.7	44.3
	20.00 – 39.99 g/day	0.661	11.3	7.6	5.3	5.9	0.0
	40.00 – 59.99 g/day	0.903	4.6	2.2	3.0	1.3	0.0
	60+ g/day	2.076	11.9	3.6	2.8	0.0	0.0
	Excess people with irregular HDOs§	1.000	7.5	4.3	1.8	0.8	0.1
2004 Non-Māori females	Abstainers	1.000	12.1	8.7	10.6	13.0	19.5
	Ex-drinkers	1.390	4.6	5.4	5.4	11.2	12.3
	0.01 – 19.99 g/day	0.884	61.6	70.5	68.1	65.0	60.1
	20.00 – 39.99 g/day	0.661	12.9	10.8	12.1	8.3	6.5
	40.00 – 59.99 g/day	0.903	3.7	2.3	2.5	1.7	1.1
	60+ g/day	2.076	4.5	2.1	1.3	0.7	0.5
	Excess people with irregular HDOs§	1.000	0.7	0.2	0.1	0.1	0.0

* Sums of age/sex/ethnicity subgroup proportions may not equal exactly 100% due to rounding.
† Estimates from HBS2003/04.
‡ Extrapolated estimates from weighted averages of proportions from HBS2003/04, NZADUS2007/08 and HtO2008/09 surveys. See report section: 'Alcohol consumption estimates for older age categories' for details about calculation methods and limitations of extrapolated estimates (i.e. high degree of uncertainty).
§ Excess proportions of people with irregular HDOs extracted from alcohol consumption categories I, II and III (relative to meta-analysis[37] proportions provided by Roerecke and Rehm).

Table E-5. New Zealand age/ethnicity subgroup alcohol consumption prevalences (%), with excess proportions of people with irregular heavy drinking occasions (HDOs) extracted for application of ischaemic heart disease RRs; 2007 males.

	Alcohol consumption category	RR	Age group (years)*				
			15–29†	30–44†	45–59†	60–69‡	70–79‡
2007 Māori males	Abstainers	1.000	1.3	1.1	1.2	3.0	2.5
	Ex-drinkers	1.210	5.8	9.2	27.2	20.1	20.3
	0.01 – 19.99 g/day	0.863	43.6	48.7	44.5	54.7	59.7
	20.00 – 39.99 g/day	0.791	12.0	11.8	7.5	9.5	8.4
	40.00 – 59.99 g/day	0.879	7.0	8.2	5.7	3.3	2.1
	60+ g/day	0.765	24.2	16.4	11.9	7.9	6.2
	Excess people with irregular HDOs§	1.000	6.1	4.6	2.0	1.5	0.8
2007 Non-Māori males	Abstainers	1.000	6.5	2.7	2.8	5.5	7.2
	Ex-drinkers	1.210	8.0	7.7	9.4	8.7	9.7
	0.01 – 19.99 g/day	0.863	46.8	56.0	58.1	57.0	57.9
	20.00 – 39.99 g/day	0.791	17.4	14.7	18.2	17.0	15.2
	40.00 – 59.99 g/day	0.879	4.7	9.5	5.0	6.2	5.6
	60+ g/day	0.765	16.2	9.2	6.3	5.6	4.3
	Excess people with irregular HDOs§	1.000	0.3	0.2	0.2	0.1	0.0

* Sums of age/sex/ethnicity subgroup proportions may not equal exactly 100% due to rounding.
† Estimates from NZADUS2007/08.
‡ Extrapolated estimates from weighted averages of proportions from HBS2003/04, NZADUS2007/08 and HtO2008/09 surveys. See report section: 'Alcohol consumption estimates for older age categories' for details about calculation methods and limitations of extrapolated estimates (i.e. high degree of uncertainty).
§ Excess proportions of people with irregular HDOs extracted from alcohol consumption categories I, II and III (relative to meta-analysis[37] proportions provided by Roerecke and Rehm).

Table E-6: New Zealand age/ethnicity subgroup alcohol consumption prevalences (%), with excess proportions of people with irregular heavy drinking occasions (HDOs) extracted for application of ischaemic heart disease RRs; 2007 females.

	Alcohol consumption category	RR	Age group (years)*				
			15–29†	30–44†	45–59†	60–69‡	70–79‡
2007 Māori females	Abstainers	1.000	1.8	2.7	2.5	11.3	11.3
	Ex-drinkers	1.390	10.9	13.6	21.4	31.0	44.4
	0.01 – 19.99 g/day	0.884	47.6	62.1	64.1	49.6	44.3
	20.00 – 39.99 g/day	0.661	9.3	7.6	2.4	5.8	0.0
	40.00 – 59.99 g/day	0.903	5.3	2.6	1.4	1.3	0.0
	60+ g/day	2.076	14.0	5.5	5.0	0.0	0.0
	Excess people with	1.000	11.1	5.9	3.2	0.9	0.1
2007 Non-Māori females	Abstainers	1.000	9.0	6.6	5.8	13.0	19.5
	Ex-drinkers	1.390	9.8	10.6	10.3	11.2	12.3
	0.01 – 19.99 g/day	0.884	61.6	68.4	68.4	65.0	60.1
	20.00 – 39.99 g/day	0.661	6.9	8.0	9.8	8.2	6.5
	40.00 – 59.99 g/day	0.903	3.2	2.1	2.8	1.7	1.1
	60+ g/day	2.076	6.2	2.7	1.7	0.7	0.5
	Excess people with	1.000	3.3	1.6	1.3	0.2	0.0

* Sums of age/sex/ethnicity subgroup proportions may not equal exactly 100% due to rounding.
† Estimates from NZADUS2007/08.
‡ Extrapolated estimates from weighted averages of proportions from HBS2003/04, NZADUS2007/08 and HtO2008/09 surveys. See report section: 'Alcohol consumption estimates for older age categories' for details about calculation methods and limitations of extrapolated estimates (i.e. high degree of uncertainty).
§ Excess proportions of people with irregular HDOs extracted from alcohol consumption categories I, II and III (relative to meta-analysis[37] proportions provided by Roerecke and Rehm).

Table E-7: Total New Zealand alcohol consumption prevalence (%) by age, with excess proportions of people with irregular heavy drinking occasions (HDOs) extracted for application of ischaemic heart disease RRs; 2004 males and females.

	Alcohol consumption category	RR	Age group (years)*				
			15–29†	30–44†	45–59†	60–69‡	70–79‡
Males	**Abstainers**	**1.000**	10.2	4.9	5.4	5.3	7.0
	Ex-drinkers	**1.210**	3.0	6.0	8.8	9.5	10.2
	0.01 – 19.99 g/day	**0.863**	41.4	54.4	56.2	56.8	58.0
	20.00 – 39.99 g/day	**0.791**	14.9	19.6	15.8	16.4	14.9
	40.00 – 59.99 g/day	**0.879**	8.4	7.6	6.3	6.0	5.5
	60+ g/day	**0.765**	20.8	6.8	7.1	5.8	4.4
	Excess people with irregular HDOs§	**1.000**	1.3	0.8	0.4	0.1	0.0
Females	**Abstainers**	**1.000**	11.4	8.7	10.9	12.9	19.1
	Ex-drinkers	**1.210**	5.2	7.1	6.8	12.7	13.9
	0.01 – 19.99 g/day	**0.863**	59.3	68.5	66.7	63.9	59.4
	20.00 – 39.99 g/day	**0.791**	12.6	10.3	11.4	8.1	6.2
	40.00 – 59.99 g/day	**0.879**	3.8	2.3	2.5	1.7	1.0
	60+ g/day	**0.765**	5.8	2.4	1.5	0.7	0.5
	Excess people with irregular HDOs§	**1.000**	1.9	0.8	0.2	0.1	0.0

* All estimates weighted by 2004 population sizes of ethnic subgroups. Sums of age/sex/ethnicity subgroup proportions may not equal exactly 100% due to rounding.
† Estimates from HBS2003/04.
‡ Extrapolated estimates from weighted averages of proportions from HBS2003/04, NZADUS2007/08 and HtO2008/09 surveys. See report section: 'Alcohol consumption estimates for older age categories' for details about calculation methods and limitations of extrapolated estimates (i.e. high degree of uncertainty).
§ Excess proportions of people with irregular HDOs extracted from alcohol consumption categories I, II and III (relative to meta-analysis[37] proportions provided by Roerecke and Rehm).

APPENDIX F: PROPORTIONS OF DEATHS IN THE OVERALL GBD 'LOWER RESPIRATORY INFECTIONS' CATEGORY THAT WERE DUE TO PARTIALLY ALCOHOL-ATTRIBUTABLE CAUSES.*

	Age group (years)				
	15–29	**30–44**	**45–59**	**60–69**	**70–79**
Males	100.0%	100.0%	93.3%	85.7%	95.3%
Female	100.0%	100.0%	85.7%	88.9%	87.9%

* New Zealand mortality data for 2004 and 2007 were combined when calculating these proportions. Please see equation 4 (page 63) and accompanying text for more details as to how these proportions were calculated and applied.

APPENDIX G: 2004 DEATHS IN SELECTED CATEGORIES AS REPORTED BY STATISTICS NEW ZEALAND AND ESTIMATED BY THE WORLD HEALTH ORGANIZATION: TOTAL NEW ZEALAND POPULATION.*

	All NZ (<80 yrs)	Males								Females							
		0–4	5–14	15–29	30–44	45–59	60–69	70–79	Total	0–4	5–14	15–29	30–44	45–59	60–69	70–79	Total
Statistics New Zealand																	
Cancers	**1646**	0	0	2	25	144	208	300	**679**	0	0	6	92	272	276	321	**967**
Neuro-psychiatric disorders	**86**	1	2	12	11	13	4	16	**59**	0	0	4	6	9	3	5	**27**
Cardiovascular disorders	**3823**	1	0	4	85	440	617	1330	**2477**	0	0	3	35	154	263	891	**1346**
Liver cirrhosis (K70 only)	**80**	0	0	0	4	17	23	12	**56**	0	0	0	4	11	4	5	**24**
Low birth weight	**51**	23	0	0	0	0	0	0	**23**	28	0	0	0	0	0	0	**28**
Respiratory disorders	**99**	8	0	2	3	6	8	30	**57**	10	0	0	0	4	8	20	**42**
Diabetes mellitus	**508**	1	1	2	9	58	94	131	**296**	0	0	0	2	45	53	112	**212**
Unintentional injuries	**880**	22	20	189	150	118	37	74	**610**	20	12	63	48	47	36	44	**270**
Intentional injuries	**521**	3	5	139	124	80	26	22	**399**	4	3	36	38	30	5	6	**122**
Totals	**7694**	59	28	350	411	876	1017	1915	**4656**	62	15	112	225	572	648	1404	**3038**
World Health Organization																	
Cancers	**1743**	0	0	3	19	150	229	322	**723**	0	0	4	92	268	285	372	**1020**
Neuro-psychiatric disorders	**76**	1	0	5	8	10	5	10	**38**	3	1	4	8	6	6	11	**37**
Cardiovascular disorders	**3742**	0	1	5	84	449	586	1240	**2365**	1	2	1	26	153	265	929	**1377**
Liver cirrhosis (K70, K73 & K74)	**97**	0	0	0	4	41	13	13	**70**	0	0	0	3	9	7	9	**27**
Low birth weight	**79**	47	0	0	0	0	0	0	**47**	32	0	0	0	0	0	0	**32**
Respiratory disorders	**94**	1	1	2	2	5	13	25	**49**	7	0	3	1	7	6	22	**45**
Diabetes mellitus	**517**	0	0	2	5	51	95	148	**301**	0	0	0	7	39	67	102	**216**
Unintentional injuries	**891**	18	26	192	155	111	75	56	**632**	23	11	66	43	48	20	47	**259**
Intentional injuries	**546**	0	4	120	133	90	25	26	**398**	1	2	46	45	34	10	11	**148**
Totals	***7784***	68	32	328	409	905	1041	1840	**4623**	66	16	124	225	564	665	1501	**3161**

* Sums of age/sex/ethnicity subgroup proportions may not equal exactly 100% due to rounding.

APPENDIX H: ALCOHOL-ATTRIBUTABLE DEATHS BY AGE/SEX/ETHNICITY SUBGROUP AND CAUSE (2004).

Table H-1: Māori alcohol-attributable deaths (2004).

	Māori Males							Māori Females							Totals		
	0-4	5-14	15-29	30-44	45-59	60-69	70-79	0-4	5-14	15-29	30-44	45-59	60-69	70-79	Male	Female	All
Mouth and oropharynx cancers	0	0	0	0	3	2	0	0	0	0	0	0	0	0	5	1	5
Oesophagus cancer	0	0	0	0	0	2	1	0	0	0	0	1	0	0	3	1	4
Colon cancer	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	2	3
Rectum cancer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Liver cancer	0	0	0	1	2	1	0	0	0	0	0	0	0	0	4	0	4
Laryngeal cancer	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1
Female breast cancer	0	0	0	0	0	0	0	0	0	1	3	5	2	2	0	13	13
Alcohol use disorders	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	2	3
Epilepsy	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1
Hypertensive heart disease	0	0	0	0	1	1	1	0	0	0	0	0	0	0	3	1	4
Ischaemic heart disease	0	0	0	-2	-8	-7	-6	0	0	0	0	1	1	6	-23	8	-15
Cardiac arrhythmias	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	2	3
Ischaemic stroke	0	0	0	0	0	0	0	0	0	0	0	-2	-1	-1	1	-4	-4
Haemorrhagic stroke	0	0	0	0	1	1	1	0	0	0	0	2	1	1	3	5	8
Oesophageal varices	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Alcoholic liver cirrhosis	0	0	0	0	2	4	1	0	0	0	0	1	1	0	7	2	9
Cholelithiasis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pancreatitis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Low birth weight	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1
Fetal alcohol syndrome	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuberculosis	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1
Lower respiratory infections: pneumonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Diabetes mellitus	0	0	0	0	-1	-2	-1	0	0	0	0	-4	-4	-2	-4	-10	-14
Road traffic injuries	1	1	22	15	2	0	0	1	1	4	5	0	0	0	42	11	53
Alcohol poisoning	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	1	2
Non-alcohol poisoning	0	0	3	1	0	0	0	0	0	1	1	0	0	0	3	1	5
Falls	0	0	1	1	2	0	0	0	0	0	0	0	0	0	4	1	5
Fire	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	1	3
Drownings	0	0	1	2	1	0	0	0	0	0	0	0	0	0	5	0	5
Other unintentional injuries	1	1	3	3	2	1	1	1	0	0	0	1	0	0	13	2	15
Self-inflicted injuries	0	0	7	6	1	0	0	0	0	2	1	0	0	0	14	3	17
Assault	0	0	3	1	1	0	0	1	0	0	0	0	0	0	6	1	7
Other intentional injuries	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total deaths caused	**4**	**2**	**42**	**33**	**21**	**14**	**9**	**2**	**1**	**9**	**14**	**15**	**7**	**12**	**125**	**61**	**186**
Total deaths prevented	**0**	**0**	**0**	**-2**	**-9**	**-9**	**-7**	**0**	**0**	**0**	**0**	**-6**	**-5**	**-3**	**-28**	**-15**	**-42**

Table H-2: Non-Māori alcohol-attributable deaths (2004).

	Non-Māori Males							Non-Māori Females							Totals		
	0-4	5-14	15-29	30-44	45-59	60-69	70-79	0-4	5-14	15-29	30-44	45-59	60-69	70-79	Male	Female	All
Mouth and oropharynx cancers	0	0	0	1	7	7	8	0	0	0	1	1	2	1	24	5	29
Oesophagus cancer	0	0	0	2	7	8	9	0	0	0	0	1	1	3	26	6	32
Colon cancer	0	0	0	0	2	4	8	0	0	0	0	2	5	8	13	15	29
Rectum cancer	0	0	0	0	3	5	6	0	0	0	0	1	3	3	14	7	21
Liver cancer	0	0	0	1	2	4	5	0	0	0	0	1	1	2	12	4	16
Laryngeal cancer	0	0	0	0	1	1	3	0	0	0	0	0	0	0	5	0	5
Female breast cancer	0	0	0	0	0	0	0	0	0	0	7	17	16	13	0	53	53
Alcohol use disorders	0	0	1	0	4	2	11	0	0	0	1	5	2	1	18	9	27
Epilepsy	0	0	3	3	2	1	1	0	0	1	1	0	0	0	9	2	11
Hypertensive heart disease	0	0	0	0	1	3	4	0	0	0	0	0	0	0	8	1	8
Ischaemic heart disease	0	0	-1	-7	-37	-57	-108	0	0	0	-1	-6	-8	-21	-210	-36	-246
Cardiac arrhythmias	0	0	0	0	0	0	3	0	0	0	0	0	0	2	3	2	6
Ischaemic stroke	0	0	0	0	0	-1	-4	0	0	0	-1	-5	-10	-39	-5	-55	-60
Haemorrhagic stroke	0	0	0	1	4	5	18	0	0	0	1	3	6	18	28	27	55
Oesophageal varices	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alcoholic liver cirrhosis	0	0	0	4	15	19	11	0	0	0	4	10	3	5	49	22	71
Cholelithiasis	0	0	0	0	0	0	-1	0	0	0	0	0	0	-1	-1	-2	-3
Pancreatitis	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	1	3
Low birth weight	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
Fetal alcohol syndrome	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuberculosis	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	2
Lower respiratory infections: pneumonia	0	0	0	0	0	0	2	0	0	0	0	0	0	1	4	2	5
Diabetes mellitus	0	0	0	-1	-2	-4	-9	0	0	0	0	-6	-8	-23	-15	-38	-54
Road traffic injuries	0	1	37	16	7	1	2	0	1	10	4	2	0	0	64	17	81
Alcohol poisonings	0	0	0	2	2	0	0	0	0	0	0	3	0	0	4	3	7
Non-alcohol poisonings	0	0	2	2	1	0	0	0	0	1	1	1	0	0	5	3	8
Falls	0	0	3	3	3	1	5	0	0	0	0	0	1	1	16	2	18
Fires	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Drownings	0	0	3	3	2	1	1	0	0	1	1	0	0	1	11	2	13
Other unintentional injuries	1	1	4	10	7	2	3	0	0	1	1	2	2	1	28	6	34
Self-inflicted injuries	0	0	16	15	9	3	1	0	0	3	3	2	0	0	43	8	52
Assault	0	0	1	2	2	0	1	0	0	0	1	1	0	0	6	3	9
Other intentional injuries	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total deaths caused	**2**	**1**	**73**	**67**	**81**	**69**	**103**	**2**	**1**	**16**	**26**	**54**	**45**	**62**	**396**	**204**	**601**
Total deaths prevented	**0**	**0**	**-1**	**-8**	**-40**	**-62**	**-121**	**0**	**0**	**0**	**-3**	**-18**	**-26**	**-84**	**-232**	**-131**	**-363**

Table H-3: Māori alcohol-attributable deaths (2007).

	Māori Males							Māori Females							Totals		
	0-4	5-14	15-29	30-44	45-59	60-69	70-79	0-4	5-14	15-29	30-44	45-59	60-69	70-79	Male	Female	All
Mouth and oropharynx cancers	0	0	0	0	1	1	2	0	0	0	0	0	0	0	4	0	4
Oesophagus cancer	0	0	0	0	1	1	1	0	0	0	0	0	0	0	3	0	3
Colon cancer	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	2
Rectum cancer	0	0	0	0	1	1	1	0	0	0	0	0	0	0	2	0	3
Liver cancer	0	0	0	1	3	1	0	0	0	0	0	0	0	0	5	1	6
Laryngeal cancer	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	2
Female breast cancer	0	0	0	0	0	0	0	0	0	0	2	5	3	2	0	12	12
Alcohol use disorders	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	2
Epilepsy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Hypertensive heart disease	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2	0	2
Ischaemic heart disease	0	0	0	-4	-7	-7	-7	0	0	0	0	2	2	7	-24	10	-14
Cardiac arrhythmias	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Ischaemic stroke	0	0	0	0	1	0	0	0	0	0	-1	-1	-1	-1	1	-4	-3
Haemorrhagic stroke	0	0	0	1	2	1	1	0	0	0	1	1	1	1	4	4	8
Oesophageal varices	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alcoholic liver cirrhosis	0	0	0	0	5	2	0	0	0	0	0	3	1	0	7	4	11
Cholelithiasis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pancreatitis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Low birth weight	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1
Fetal alcohol syndrome	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuberculosis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lower respiratory infections: pneumonia	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2
Diabetes mellitus	0	0	0	0	0	-1	-2	0	0	0	0	-3	-4	-2	-4	-10	-14
Road traffic injuries	1	1	22	13	3	0	0	0	1	7	2	0	0	0	40	11	50
Alcohol poisoning	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1	2
Non-alcohol poisoning	0	0	2	1	1	0	0	0	0	1	0	0	0	0	5	2	6
Falls	0	0	0	1	0	1	0	0	0	0	0	0	0	0	3	1	4
Fire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Drownings	0	0	1	2	3	0	0	0	0	0	1	0	0	0	7	1	8
Other unintentional injuries	5	1	1	6	3	0	0	1	0	0	0	1	0	0	16	2	18
Self-inflicted injuries	0	0	6	6	1	0	0	0	0	1	1	0	0	0	13	3	15
Assault	0	0	2	1	0	0	0	1	0	0	1	0	0	0	4	3	7
Other intentional injuries	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total deaths caused	**6**	**2**	**35**	**32**	**27**	**12**	**9**	**3**	**1**	**11**	**9**	**16**	**8**	**13**	**124**	**62**	**185**
Total deaths prevented	**0**	**0**	**0**	**-4**	**-7**	**-8**	**-8**	**0**	**0**	**0**	**-1**	**-5**	**-5**	**-4**	**-28**	**-14**	**-42**

Table H-4: Non-Māori alcohol-attributable deaths (2007).

	Non-Māori Males							Non-Māori Females							Totals		
	0-4	5-14	15-29	30-44	45-59	60-69	70-79	0-4	5-14	15-29	30-44	45-59	60-69	70-79	Male	Female	All
Mouth and oropharynx cancers	0	0	0	1	6	11	9	0	0	0	0	2	2	3	27	6	33
Oesophagus cancer	0	0	0	1	6	11	14	0	0	0	0	1	2	2	31	5	36
Colon cancer	0	0	0	0	2	5	7	0	0	0	1	2	6	9	15	17	33
Rectum cancer	0	0	0	0	2	6	7	0	0	0	1	2	2	3	16	8	24
Liver cancer	0	0	0	0	4	5	6	0	0	0	0	1	1	1	15	4	19
Laryngeal cancer	0	0	0	0	2	2	2	0	0	0	0	0	0	1	5	1	6
Female breast cancer	0	0	0	0	0	0	0	0	0	0	7	23	16	14	0	60	60
Alcohol use disorders	0	0	0	0	3	5	3	0	0	0	0	2	2	0	11	4	15
Epilepsy	0	0	1	2	2	1	1	0	0	1	0	1	0	1	7	3	10
Hypertensive heart disease	0	0	0	0	1	2	5	0	0	0	0	0	0	0	9	1	9
Ischaemic heart disease	0	0	0	-7	-37	-47	-85	0	0	0	0	-3	-7	-15	-176	-25	-201
Cardiac arrhythmias	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	2
Ischaemic stroke	0	0	0	0	0	-1	-3	0	0	0	-1	-6	-8	-32	-5	-47	-52
Haemorrhagic stroke	0	0	0	1	4	5	15	0	0	0	1	5	4	15	25	25	50
Oesophageal varices	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1
Alcoholic liver cirrhosis	0	0	0	3	25	20	7	0	0	0	5	6	10	1	55	22	77
Cholelithiasis	0	0	0	0	0	0	-1	0	0	0	0	0	0	-1	-1	-1	-2
Pancreatitis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Low birth weight	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Fetal alcohol syndrome	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuberculosis	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1
Lower respiratory infections: pneumonia	0	0	0	0	1	0	2	0	0	0	0	0	0	1	3	2	5
Diabetes mellitus	0	0	0	0	-4	-4	-8	0	0	0	-2	-6	-11	-18	-17	-37	-54
Road traffic injuries	1	1	37	20	4	1	2	0	1	7	4	2	0	0	65	15	81
Alcohol poisonings	0	0	0	2	5	0	1	0	0	0	0	0	0	0	8	0	8
Non-alcohol poisonings	0	0	4	4	1	0	0	0	0	0	2	2	0	0	10	4	14
Falls	0	0	1	1	2	2	5	0	0	0	1	1	1	1	12	4	15
Fires	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2	0	3
Drownings	0	0	4	2	3	1	1	0	0	0	0	0	0	0	11	1	12
Other unintentional injuries	1	1	5	10	9	3	3	0	0	1	1	1	0	2	32	6	38
Self-inflicted injuries	0	0	13	17	10	3	1	0	0	2	4	3	1	0	44	9	53
Assault	0	0	3	1	2	0	0	0	0	2	1	0	0	0	7	4	11
Other intentional injuries	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Total deaths caused	**3**	**2**	**69**	**66**	**94**	**86**	**93**	**1**	**1**	**13**	**29**	**54**	**49**	**55**	**414**	**203**	**617**
Total deaths prevented	**0**	**0**	**0**	**-7**	**-41**	**-52**	**-98**	**0**	**0**	**0**	**-3**	**-15**	**-26**	**-66**	**-198**	**-111**	**-309**

APPENDIX I: FURTHER RESULTS FOR 2004 ALCOHOL-ATTRIBUTABLE MORTALITY.

MORTALITY BY SEX (2004)

Years of Life Lost

Our years of life lost (YLL) estimates incorporated the impact of deaths at different ages (0–79 years) so that deaths at younger ages resulted in more years of life lost than deaths at older ages. As shown below, since injury deaths occur more often in younger age groups, injuries are responsible for an even larger proportion of alcohol-attributable YLLs than for alcohol-attributable deaths.

The YLL estimates showed a greater disparity between sexes than previously shown for alcohol-attributable deaths, with the alcohol-attributable YLL burden 2.3 times higher in men (n = 9,534) than women (n = 4,070). Most of the leading causes of alcohol-attributable YLLs were similar to the leading causes of alcohol-attributable deaths, as seen in Table I-1 I-1. Road traffic injuries were responsible for 32.2% of alcohol-attributable YLLs in males (n = 3,070) and 20.7% in females (n = 841). For both males and females, the proportion of alcohol-attributable burden due to self-inflicted injuries was higher for YLLs than for deaths.

Table I-1: Top five causes of alcohol-attributable years of life lost (AA YLLs), by sex (0–79 years; 2004).

Males	% of AA YLLs (N = 9534)	Females	% of AA YLLs (N = 4070)
Road traffic injuries	32.2%	Female breast cancer	21.9%
Self-inflicted injuries	15.3%	Road traffic injuries	20.7%
Other unintentional injuries	9.2%	Alcoholic liver cirrhosis	8.6%
Alcoholic liver cirrhosis	6.6%	Self-inflicted injuries	7.1%
Falls	3.8%	Haemorrhagic stroke	6.8%

Table I-2 shows that injuries accounted for two-thirds of all years of life lost due to alcohol consumption: 73% of male and 42% of female alcohol-attributable years of life lost.

Table I-2: Alcohol-attributable YLLs due to cancer, other conditions, and injuries; by sex (0–79 years; 2004).

	Male YLLs		Female YLLs		Total YLLs	
	N	%	N	%	N	%
Cancers	1046	11.0%	1324	32.5%	2370	17.4%
Other conditions	1577	16.5%	1047	25.7%	2624	19.3%
Injuries	6912	72.5%	1699	41.7%	8610	63.3%

YLLs prevented due to alcohol consumption are summarised in Table I-3 by condition. The YLL proportions are similar to the proportions of deaths prevented by alcohol consumption, since most mortality caused by these conditions occurs in older age groups.

Table I-3: Male and female YLLs prevented by alcohol consumption, by condition (0–79 years; 2004).

	Male YLLs		Female YLLs		Total YLLs	
	N	%	N	%	N	%
Ischaemic heart disease	2012	90.3%	311	25.8%	2323	67.7%
Ischaemic stroke	34	1.5%	445	37.0%	480	14.0%
Diabetes	169	7.6%	428	35.6%	597	17.4%
Cholelithiasis	12	0.5%	20	1.7%	32	0.9%

MORTALITY BY SEX/ETHNICITY SUBGROUP (2004)

Deaths

The total number of alcohol-attributable deaths in males was approximately double the number of female deaths for both Māori and non-Māori New Zealanders in 2004. The leading causes of alcohol-attributable death were the same for both groups (Table I-I-4). Road traffic injuries were the most common cause of deaths in Māori and non-Māori males, while breast cancer was the most common cause in Māori and non-Māori females.

There are several ethnic differences in ranking order and proportions of causes of alcohol-attributable deaths (see Table I-I-4). However, caution is advised when interpreting these figures due to small numbers in many groups, particularly for Māori. Ischaemic heart disease emerged as the third leading cause of alcohol-attributable deaths in Māori women. This was due to the relatively high proportions of older Māori females who were ex-drinkers (see Appendix E, Table E-4 for detailed consumption data), as female ex-drinkers are approximately 40% more likely to die from ischaemic heart disease compared to female lifetime abstainers (see Table 14 page 39 for mortality relative risks for ischaemic heart disease). This result differs from all the other sex/ethnicity subgroups, for whom the net effect of alcohol consumption on ischaemic heart disease deaths is estimated to be preventive (see Table 15 and Table 16 on pages 42 and 43 for 2004 ischaemic heart disease mortality AAFs by age/sex/ethnicity subgroup).

Table I-4: Top five causes of alcohol-attributable (AA) deaths, by sex and ethnicity (0–79 years; 2004).

Males	% of AA deaths	Females	% of AA deaths
Māori	**(N = 125)**	**Māori**	**(N = 61)**
Road traffic injuries	33.5%	Female breast cancer	21.7%
Self-inflicted injuries	11.1%	Road traffic injuries	18.3%
Other unintentional injuries	10.2%	Ischaemic heart disease	13.3%
Alcoholic liver cirrhosis	5.6%	Haemorrhagic stroke	7.6%
Violence	5.0%	Self-inflicted injuries	4.8%
Non-Māori	**(N = 396)**	**Non-Māori**	**(N = 204)**
Road traffic injuries	16.2%	Female breast cancer	26.2%
Alcoholic liver cirrhosis	12.4%	Haemorrhagic stroke	13.3%
Self-inflicted injuries	10.9%	Alcoholic liver cirrhosis	10.8%
Haemorrhagic stroke	7.1%	Road traffic injuries	8.1%
Other unintentional injuries	7.0%	Colon cancer	7.6%

Māori men had the highest proportion of deaths in 2004 attributed to alcohol consumption (9.1%). In contrast, 5.8% of all deaths in Māori women were attributed to alcohol, while alcohol consumption in non-Māori men and women was responsible for 5.2% and 3.8% of their total annual deaths, respectively (TablI-5).

To enable direct comparisons of alcohol-attributable deaths by sex and ethnicity subgroups while controlling for differences in age structure of the populations, we calculated standardised rates of mortality per 100,000 people using the WHO world population[57] as the standard population (see Tabl I-5). The alcohol-attributable death rate for Māori overall was 2.7 times the rate for non-Māori when standardisation had adjusted for the effect of differences in the age structures. In addition to the ethnic disparity in alcohol-attributable deaths, Figure I-1 illustrates how men of both ethnic groups had double the standardised death rate of women.

Table I-5: Alcohol-attributable deaths caused and prevented, by sex and ethnicity (0–79 years; 2004).

	Ethnicity	Deaths caused (count)	% of all deaths	Deaths caused (rate*)	Deaths prevented
Males	Māori	125	9.1%	50.7	28
	Non-Māori	396	5.2%	19.0	232
	Total	521	5.8%	23.0	259
Females	Māori	61	5.8%	23.9	15
	Non-Māori	204	3.8%	8.6	131
	Total	265	4.2%	10.2	145
Total	Māori	186	7.7%	36.8	42
	Non-Māori	601	4.7%	13.7	363
	Total	787	5.1%	16.5	405

* Rate per 100,000 age-standardised to WHO world population

Figure I-1: Population standardised alcohol-attributable deaths per 100,000 people, by sex and ethnicity (0–79 years; 2004).

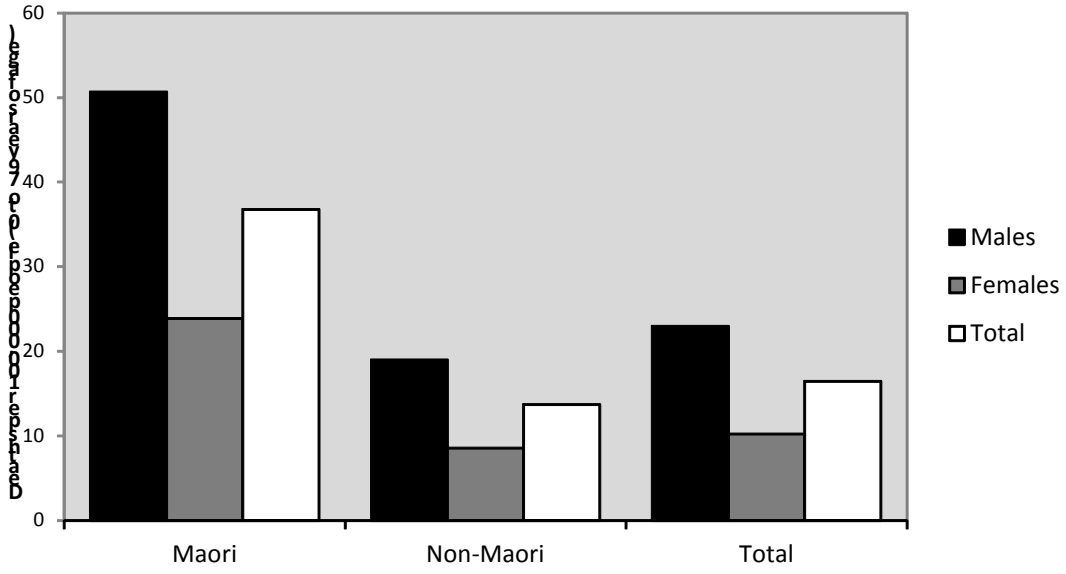


Table I-6 shows that sex and ethnic differences in alcohol-attributable deaths were mostly due to injury deaths, whereas the proportions of condition deaths attributable to alcohol consumption did not vary markedly by sex or ethnicity. The results in Table I-6 also demonstrate the substantial contribution of alcohol consumption to injury deaths in both sexes and ethnicities, with estimates of alcohol-attributable injury deaths as a proportion of all injury deaths ranging from 16% in non-Māori females to 36% in Māori males.

Table I-6: Alcohol-attributable (AA) condition and injury deaths, by sex and ethnicity (0–79 years; 2004).

	Ethnicity	Conditions: AA deaths caused	% of total condition deaths	Injuries: AA deaths caused	% of total injury deaths
Males	Māori	34	3.1%	91	36.2%
	Non-Māori	217	3.2%	179	23.6%
	Total	251	3.2%	270	26.7%
Females	Māori	40	4.2%	21	21.8%
	Non-Māori	158	3.1%	46	15.5%
	Total	198	3.3%	67	17.1%
Total	Māori	75	3.6%	111	32.2%
	Non-Māori	375	3.2%	226	21.3%
	Total	450	3.2%	337	24.0%

Table I-7 provides the estimated alcohol-attributable death numbers by sex/ethnicity subgroup, showing the differences within each specific condition and injury category.

Table I-7: Number of alcohol-attributable deaths for each condition and injury category, by sex and ethnicity (0–79 years; 2004).*

	Māori			Non-Māori			Total		
	Males	Females	All	Males	Females	All	Males	Females	All
Conditions									
Mouth and oropharyngeal cancers	5	1	5	24	5	29	28	6	34
Oesophagus cancer	3	1	4	26	6	32	29	7	36
Colon cancer	1	2	3	13	15	29	14	17	32
Rectum cancer	1	1	2	14	7	21	16	8	24
Liver cancer	4	0	4	12	4	16	16	4	20
Laryngeal cancer	1	0	1	5	0	5	6	0	6
Female breast cancer		13	13		53	53		67	67
Alcohol use disorders	1	2	3	18	9	27	19	11	30
Epilepsy	1	0	1	9	2	11	11	2	13
Hypertensive heart disease	3	1	4	8	1	8	11	1	12
Ischaemic heart disease†	-23	8	-15	-210	-36	-246	-233	-28	-261
Cardiac arrhythmias	1	2	3	3	2	6	4	4	8
Ischaemic stroke†	1	-4	-4	-5	-55	-60	-5	-59	-64
Haemorrhagic stroke	3	5	8	28	27	55	31	32	63
Oesophageal varices	0	1	1	0	0	0	0	1	1
Alcoholic liver cirrhosis	7	2	9	49	22	71	56	24	80
Cholelithiasis	0	0	0	-1	-2	-3	-1	-2	-4
Pancreatitis	0	0	0	2	1	3	2	1	3
Low birth weight	1	1	1	0	1	1	1	1	3
Fetal alcohol syndrome	0	0	0	0	0	0	0	0	0
Tuberculosis	1	0	1	1	1	2	2	1	4
Lower resp. infections: pneumonia	1	0	1	4	2	5	4	2	6
Diabetes mellitus	-4	-10	-14	-15	-38	-54	-20	-48	-68
Injuries									
Road traffic injuries	42	11	53	64	17	81	106	28	134
Alcohol poisonings	1	1	2	4	3	7	5	4	9
Non-alcohol poisonings	3	1	5	5	3	8	9	4	13
Falls	4	1	5	16	2	18	20	3	23
Fires	2	1	3	1	1	3	4	2	6
Drownings	5	0	5	11	2	13	15	2	18
Other unintentional injuries	13	2	15	28	6	34	41	9	49
Self-inflicted injuries	14	3	17	43	8	52	57	11	68
Assault	6	1	7	6	3	9	12	4	16
Other intentional injuries	0	0	0	0	0	1	1	0	1

* Totals may not exactly equal the sums of components. This is a result of the table estimates being rounded to the nearest whole number, while totals are calculated from actual estimates with several decimal places.

† For ischaemic heart disease and ischaemic stroke, please note that totals are *net* deaths due to several instances where totals combine positive and negative numbers of deaths. Please see 0 for detailed alcohol-attributable death numbers for each age/sex/ethnicity subgroup.

Years of Life Lost

For both Māori and non-Māori, alcohol-attributable injuries contributed a larger proportion of alcohol-attributable YLLs than alcohol-attributable deaths (Table I-8). This is due to the lower average age of death for injuries than for most other conditions.

Table I-8: Top five causes of alcohol-attributable years of life lost (AA YLLs), by sex and ethnicity (0–79 years; 2004).

Males	% of AA YLLs	Females	% of AA YLLs
Māori	**(N = 2921)**	**Māori**	**(N = 1167)**
Road traffic injuries	42.0%	Road traffic injuries	28.9%
Self-inflicted injuries	13.5%	Female breast cancer	18.5%
Other unintentional injuries	10.1%	Self-inflicted injuries	7.7%
Violence	5.8%	Haemorrhagic stroke	5.2%
Drownings	4.2%	Ischaemic heart disease	5.2%
Non-Māori	**(N = 6614)**	**Non-Māori**	**(N = 2903)**
Road traffic injuries	27.9%	Female breast cancer	23.2%
Self-inflicted injuries	16.1%	Road traffic injuries	17.3%
Other unintentional injuries	8.7%	Alcoholic liver cirrhosis	11.0%
Alcoholic liver cirrhosis	8.4%	Haemorrhagic stroke	7.4%
Falls	4.2%	Self-inflicted injuries	6.9%

As seen in Table I- I-9, the proportions of YLLs attributed to alcohol consumption in 2004 were higher than for deaths, with 8.0% of all New Zealand YLLs in 2004 attributed to alcohol, compared to 5.1% of deaths. The sex-specific proportions of YLLs attributed to alcohol consumption were 9.6% for men and 5.8% for women (compared to 5.8% and 4.2% of deaths in men and women, respectively).

Table I- also shows that the alcohol-attributable YLL rate for Māori overall was 2.7 times the non-Māori rate when the differences in age structure had been adjusted for. This was the same magnitude of ethnic disparity estimated for the standardised death rates. Sex differences were also present in standardised YLL rates, with the rate of alcohol-attributable YLLs in Māori and non-Māori men 2.6 times the corresponding female YLL rates (Table I-9). This sex difference in YLL rates was larger than that estimated for alcohol-attributable death rates.

Table I-9: Alcohol-attributable years of life lost (YLLs) caused and prevented, by sex and ethnicity (0–79 years; 2004).

	Ethnicity	YLLs caused (count)	% of all YLLs*	YLLs caused (rate)**	YLLs prevented
Males	Māori	2921		1072	309
	Non-Māori	6614		387	1919
	Total	9534	9.6%	488	2228
Females	Māori	1167		414	173
	Non-Māori	2903		149	1033
	Total	4070	5.8%	186	1206
Total	Māori	4088		731	481
	Non-Māori	9517		267	2952
	Total	13605	8.0%	335	3433

*We were unable to calculate the proportions of all Māori and non-Māori YLLs that were attributable to alcohol because GBD YLL denominator data was not available by ethnicity.
**Rate per 100,000 age-standardised to WHO world population.

MORTALITY BY AGE/SEX SUBGROUP (2004)

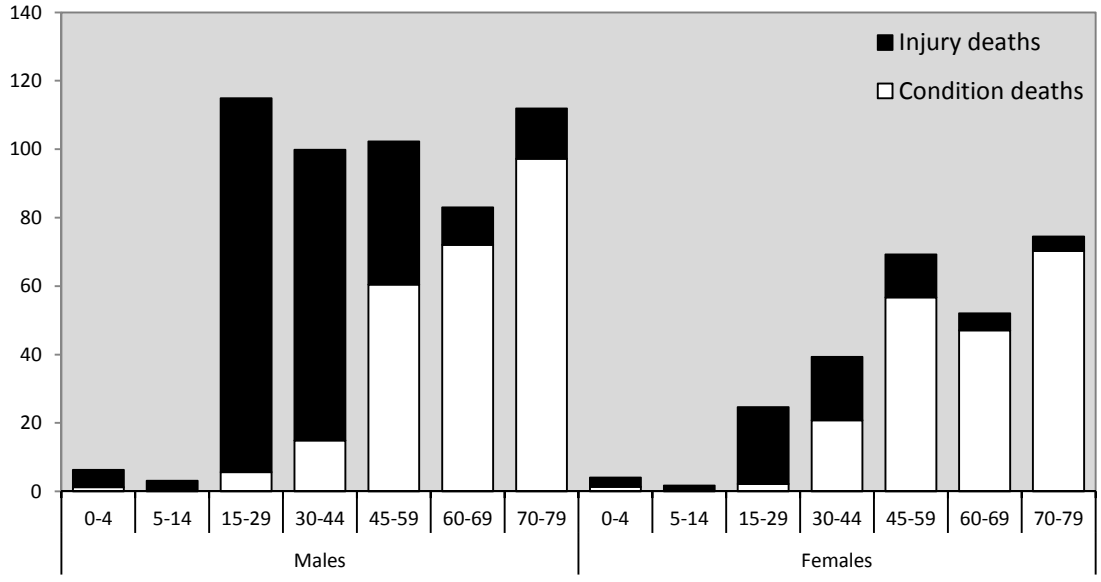
Deaths

Table I-10 details the how the numbers of alcohol-attributable deaths caused by injuries and conditions varied by age and sex. Injuries were responsible for most alcohol-attributable deaths in young adults with a transition in the older age groups to fewer alcohol-attributed injury deaths and more deaths due to alcohol-attributable conditions. This transition from alcohol-attributable injury deaths to condition deaths was more apparent and appeared later in life for men than women (Figure I-2).

Table I-10: Alcohol-attributable (AA) condition and injury deaths, by age and sex (2004).

	Age category (years)	AA deaths caused	% of total deaths	Conditions: AA deaths caused	Injuries: AA deaths caused
Males	0-4	6	3.0%	1	5
	5-14	3	5.6%	0	3
	15-29	115	27.6%	6	109
	30-44	100	16.6%	15	85
	45-59	102	6.5%	60	42
	60-69	83	3.9%	72	11
	70-79	112	2.8%	97	15
	Total	**521**	**5.8%**	**251**	**270**
Females	0-4	4	2.1%	1	3
	5-14	2	4.8%	0	2
	15-29	25	14.5%	2	22
	30-44	39	9.7%	21	19
	45-59	69	5.9%	57	13
	60-69	52	3.5%	47	5
	70-79	75	2.5%	70	4
	Total	**265**	**4.2%**	**198**	**67**

Figure I-2: Number of condition and injury deaths attributable to alcohol consumption, by age and sex (2004).



We further examined the composition of the alcohol-attributable death burden by broad injury and condition categories in adult males (Figure I-3) and females (Figure I-4). These figures highlight the prominent role of injuries in the youngest age groups (i.e. 95% and 91% of alcohol-attributable deaths in 15–29 year old males and females, respectively) and the increasing role of cancers and cardiovascular disorders with age. For detailed lists of the specific conditions and injuries included within each broad cause category, please see Table 3 on page 13 (conditions) and Table 6 on page 17 (injuries).

Figure I-3: Males: Causes of alcohol-attributable deaths, by age (2004).

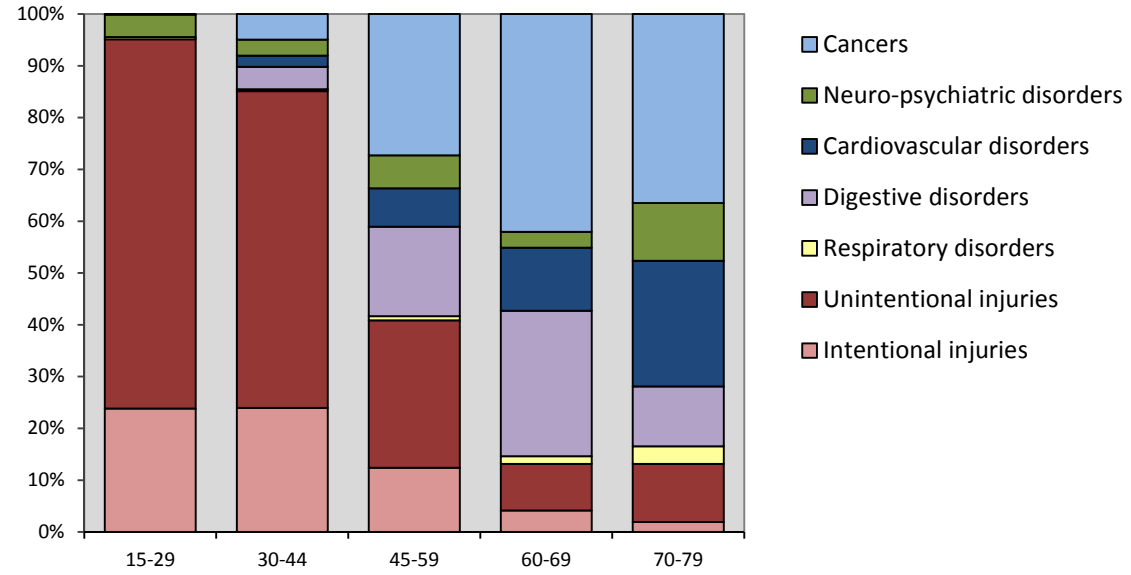
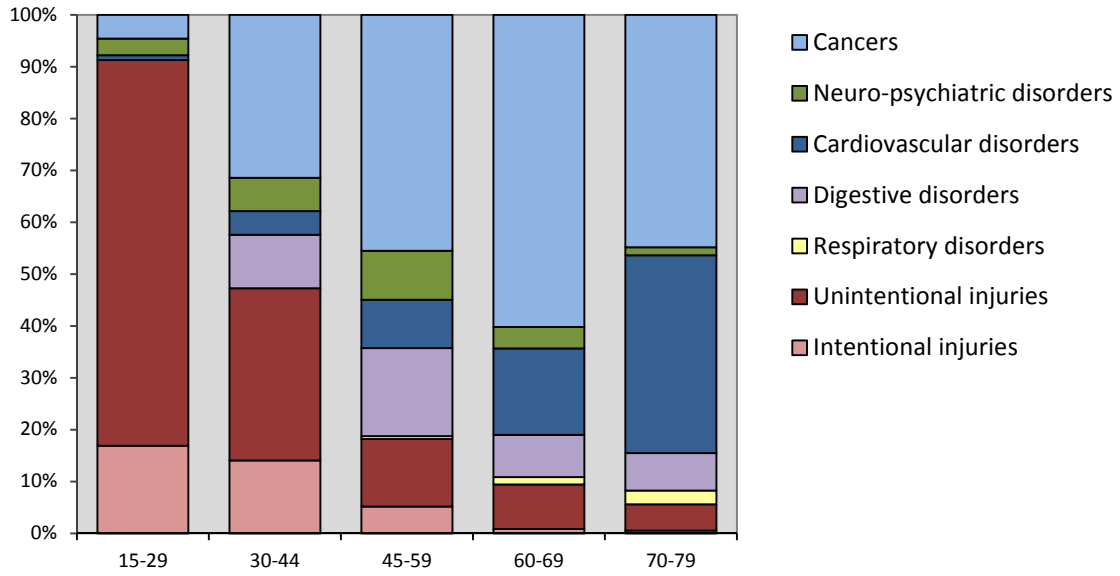


Figure I-4: Females: Causes of alcohol-attributable deaths, by age (2004).



MORTALITY BY AGE/ETHNICITY SUBGROUP (2004)

Deaths

The absolute numbers of Māori and non-Māori deaths caused and prevented by alcohol consumption are presented by age category in Figure I-5 and Figure I-6. The largest number of alcohol-attributed Māori deaths occurred in young adults with fewer deaths in older age categories, whereas for non-Māori the number of alcohol-attributed deaths increased with increasing age. For both Māori and non-Māori, most deaths prevented by alcohol consumption would have occurred in people 45 years and older.

The Māori and non-Māori populations have different age structures, with relatively larger proportions of younger Māori and older non-Māori (i.e. in 2004, 61% of the Māori population and 39% of the non-Māori population was aged 0–29 years, while 6% of Māori and 15% of non-Māori were 60–79 years old). These contrasting age structures are reflected in the larger number of absolute deaths caused and prevented within younger age categories for Māori (Figure I-5) and older age categories for non-Māori (Figure I-6)

When the impact of the age structures on the alcohol-attributable death burden is adjusted for by calculating age/ethnicity-specific rates (i.e. dividing death numbers by the population size of each age/ethnicity subgroup), the Māori alcohol-attributable death rates are more than double the corresponding non-Māori rates for each age group, with similar rates of deaths prevented for 70–79 year olds (see Table I-11).

Figure I-5: Number of Māori deaths caused and prevented by alcohol consumption, by age (2004).

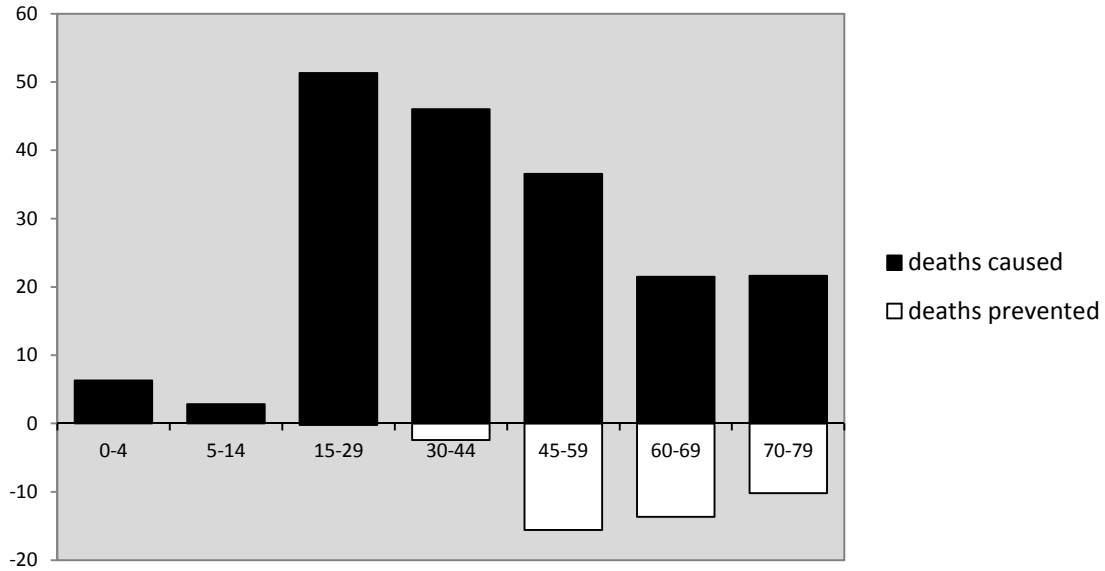


Figure I-6: Number of non-Māori deaths caused and prevented by alcohol consumption, by age (2004).

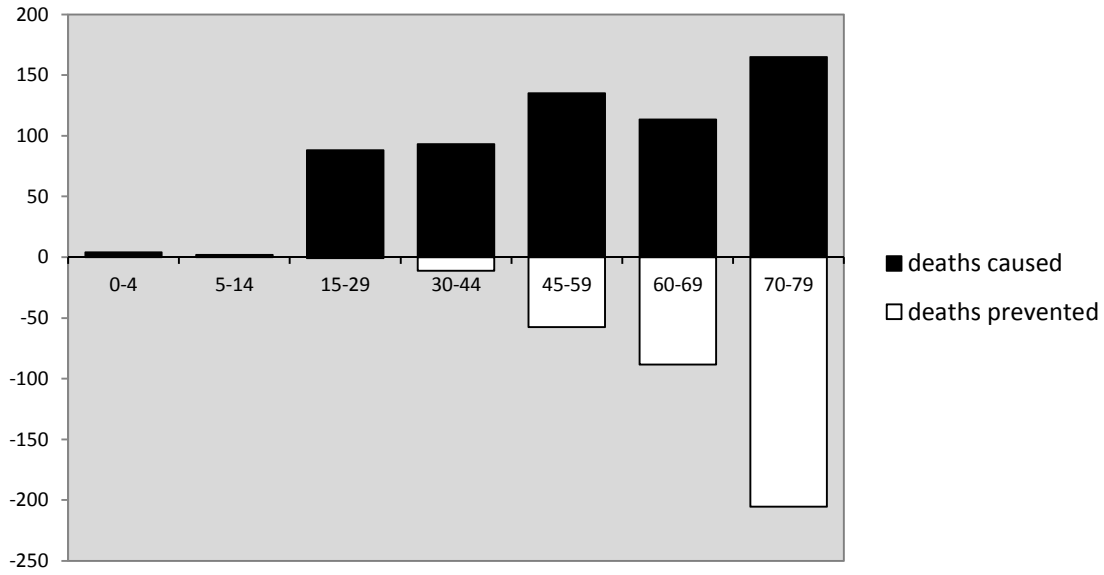


Table I-11: Māori and non-Māori alcohol-attributable death rates, by age (2004).

	0-4	5-14	15-29	30-44	45-59	60-69	70-79
Deaths caused (rate*)							
Māori	9	2	33	36	48	90	210
Non-Māori	2	0	13	12	20	39	78
Deaths prevented (rate*)							
Māori	0	0	0	-2	-21	-57	-99
Non-Māori	0	0	0	-1	-8	-30	-97

* Death rates per 100,000 using 2004 population numbers for each age/ethnicity subgroup as denominators.

Years of Life Lost

The impact of deaths at different ages was taken into account by calculating the alcohol-attributable years of life lost (YLLs) by age/ethnicity subgroup. For both Māori (Figure I-7) and non-Māori (Figure I-8), a higher proportion of the overall YLL burden was due to deaths in younger age groups. Due to the older age structure of the non-Māori population, the pattern of alcohol-attributable YLLs by age group was markedly different from that seen for alcohol-attributable deaths (Figure I-6), with a decreasing contribution to the YLL burden with increasing age.

Figure I-7: Number of Māori YLLs caused and prevented by alcohol consumption, by age (2004).

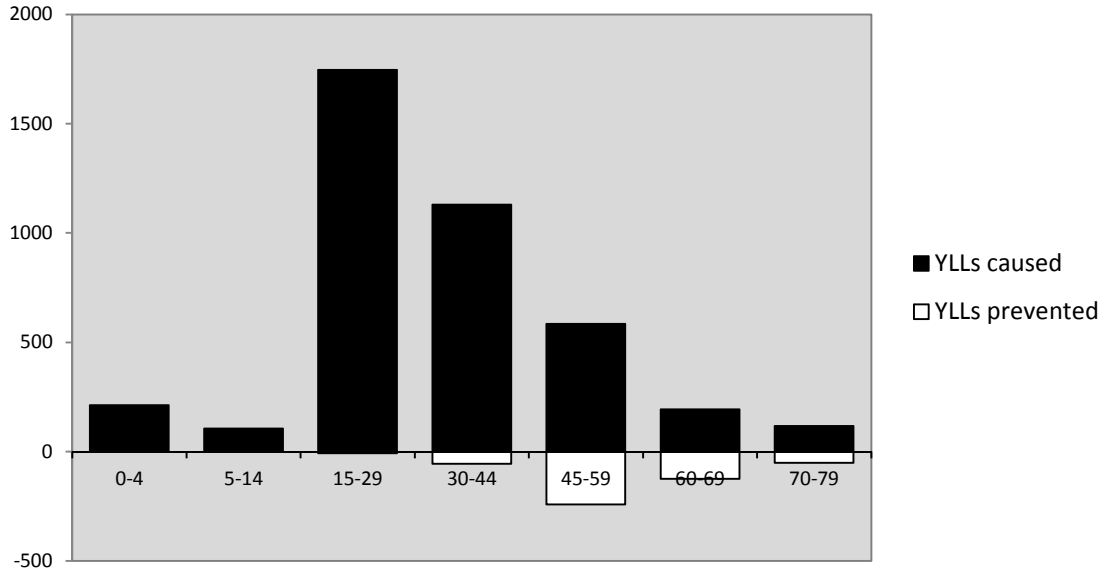
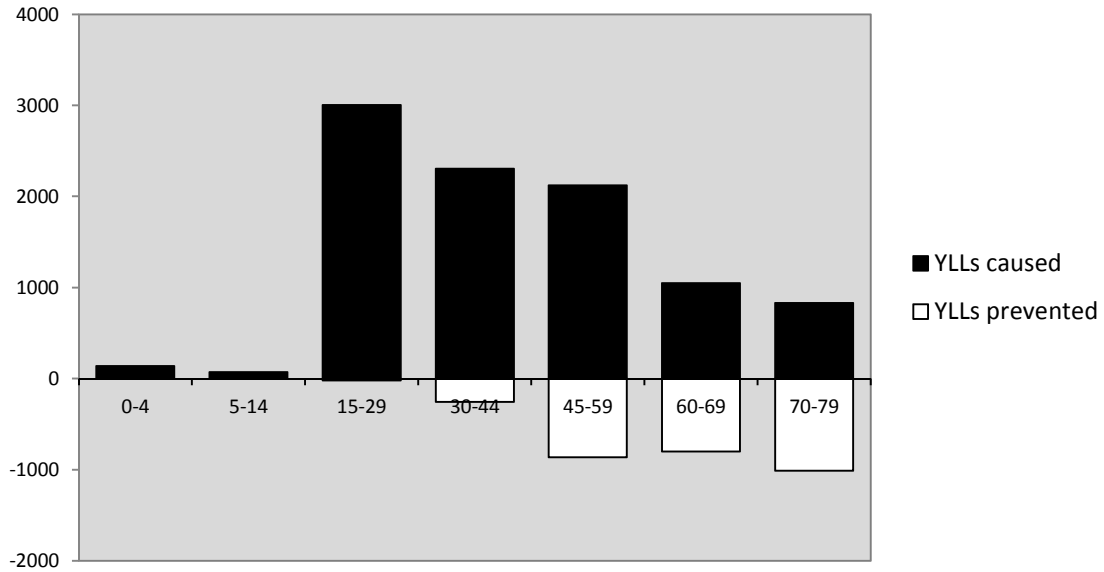


Figure I-8: Number of non-Māori YLLs caused and prevented by alcohol consumption, by age (2004).



MORTALITY BY AGE/SEX/ETHNICITY SUBGROUP (2004)

The absolute numbers of alcohol-attributable deaths and YLLs are presented in Table I-12 by age/sex/ethnicity subgroup.

Tablel-12: Number of alcohol-attributable deaths and years of life lost (YLLs); by age, sex and ethnicity (2004).

	Ethnicity	0-4	5-14	15-29	30-44	45-59	60-69	70-79
Males	Māori	4 (129)	2 (71)	42 (1432)	33 (789)	21 (332)	14 (119)	9 (49)
	Non-Māori	2 (84)	1 (44)	73 (2464)	67 (1656)	81 (1259)	69 (615)	103 (493)
	Totals	6 (213)	3 (115)	115 (3896)	100 (2444)	102 (1591)	83 (734)	112 (541)
Females	Māori	2 (83)	1 (35)	9 (315)	14 (341)	15 (252)	7 (74)	12 (68)
	Non-Māori	2 (54)	1 (28)	16 (538)	26 (647)	54 (862)	45 (433)	62 (340)
	Total	4 (137)	2 (63)	25 (853)	39 (989)	69 (1114)	52 (507)	75 (408)
Total	Māori	6 (212)	3 (106)	51 (1746)	46 (1130)	37 (584)	21 (193)	22 (117)
	Non-Māori	4 (138)	2 (72)	88 (3002)	93 (2303)	135 (2121)	114 (1048)	165 (832)
	Total	10 (350)	5 (178)	140 (4749)	139 (3433)	172 (2705)	135 (1241)	186 (949)

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