Report to:

Canterbury DHB

COSTS OF HARMFUL ALCOHOL USE IN CANTERBURY DHB

Prepared by

Dr Adrian Slack

Dr Ganesh Nana

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Business and Economic Research Limited, BERL House, 108 The Terrace, PO Box 10277, Wellington 6143, New Zealand

T: 04 931 9200 F: 04 932 9202 info@berl.co.nz www.berl.co.nz

Costs of Harmful Alcohol Use in Canterbury DHB

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1 Summary

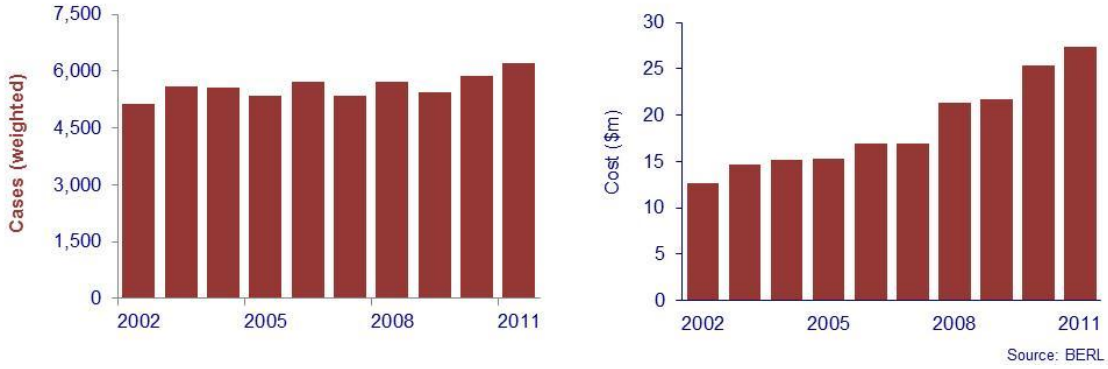
Canterbury DHB commissioned BERL to analyse the costs of alcohol harm in the Canterbury region.

Around **19,180 people were admitted to Canterbury hospitals during 2011 where alcohol was a contributing factor**. This level has increased substantially over the past decade, rising from 15,070 admissions in 2002 and 16,220 admissions in 2006.

After taking into account how much alcohol contributed to a person's admission, about one third of these admissions can be attributed to alcohol use. Adjusting for the complexity and cost of treatment, the admission figures translate to **6,211 cost-weighted cases in 2011**, having risen from 5,126 cases in 2002 and 5,371 cases in 2006.

We estimate that the region's 6,211 **alcohol attributable cases in 2011 cost the hospital system $27.4 million**. Between 2006 and 2011, the rising number of cases (8.4 percent) and treatment costs (50 percent) combined to increase hospital costs by $10.5 million (62.1 percent) from an estimated $16.9 million in 2006.

Number and cost of alcohol-related hospital cases (weighted) in Canterbury



Source: BERL

The wider costs to Canterbury's health care system were $62.8 million in 2011. These costs are pro rata calculations based on the relativity between the estimated hospital costs (above) and other health care costs due to harmful alcohol use calculated by BERL (2009).

Health care costs in Canterbury, 2006 and 2011 ($m)

Canterbury health care ($m)	2006	2011
Hospitals	16.9	27.4
Other medical	8.8	14.3
Treatment for victims of crime	13.1	21.2
Total	**38.8**	**62.8**

Source: BERL

2 Background

2.1 Research scope

This study examines the health care costs in Canterbury due to the harmful use of alcohol. These costs are termed 'social costs' where harmful use results in costs borne by the individual or wider society and:

- the consumer does not bear all the costs, or
- the decisions are not fully informed, rational or consistent with their long-term welfare.

We refer to the literature and use the methodology applied by Slack et al (2009), which estimated the social costs of harmful alcohol and other drug (AOD) use in New Zealand in 2006. Some brief notes on that methodology are included in an Appendix to this report.

This project focuses on analysing alcohol related hospital admissions up to the latest available year (ended 30 June 2011). We use the hospital admission statistics to estimate the costs of hospital care related to acute or chronic conditions attributable to alcohol use.

Based on the relativity between hospital and other health care costs from Slack et al (2009), we provide an indication of the magnitude of other health care costs in Canterbury, such as treatment for victims of crime and primary care. This is done using a pro rata calculation.

2.2 Harmful alcohol use

Harmful alcohol use includes "hazardous" or "high risk" drinking patterns (English et al 1995, Rehm et al 2004, Connor et al 2005).[1] While the threshold for harmful use is controversial, we anchor our definition in the epidemiological literature and with reference to previous drug cost studies (English et al 1995, Ezzati et al 2004, Rehm et al 2004, Connor et al 2005).

The thresholds for harmful use are typically expressed in terms of daily consumption. However, actual use may be substantially higher than these thresholds, and may be concentrated in binge drinking, which tends to exacerbate the harm.

[1] Epidemiological literature and previous drug abuse cost studies were used to determine thresholds for harmful AOD use (English et al 1995, Ezzati et al 2004, Rehm et al 2004, Connor et al 2005). This study defines harmful alcohol use as average daily consumption of alcohol per day over 20 grams for women and 40 grams for men.

2.3 Impacts of harmful use

Harmful use can cover a broad range of personal, economic, and social impacts. For this project, we focus on hospital and other health care due to harmful alcohol use.[2]

The disease and disability attributable to alcohol consumption in New Zealand is based on hospital admission records in the National Minimum Data Set (NMDS) provided by the New Zealand Health Information Service (NZHIS).[3] The admission records are coded by the treatment a patient received and diagnosis of disease or injury.[4] The cases are then weighted according to their complexity and cost. Below we refer to these as *weighted cases*.

Proportions of these weighted cases can be attributed to alcohol using *attributable fractions,* referred to as alcohol attributable fractions (AAFs). Some conditions, for example are wholly attributable to alcohol use, such as alcoholic polyneuropathy. Such a case would take a fraction of 1.0. Others conditions are partly attributable to alcohol use, such as road injuries. The fraction of these injuries differs by age and gender. For example, just under one third (0.327) of road injuries amongst males aged 20-29 are attributed to alcohol, while the proportion for females in this age group is just over one seventh (0.150).

We use the attributable fractions tabulated in Collins and Lapsley's (2008) study of alcohol and drug costs in Australia. We add three conditions to Collins and Lapsley's list that, by definition, are conditions wholly attributable to alcohol consumption, and which are included by Jones et al (2008).[5] These are:

- alcohol-induced pseud-Cushings disease
- degeneration of the nervous system due to alcohol
- alcoholic myopathy.

The alcohol-attributable health conditions examined in this study are listed in an appendix (see page 16).

[2] The updated mortality and morbidity are then used to pro rate the other categories of social cost estimated in Slack et al (2009). This simple exercise is intended to give an indication of the other costs, as the earlier study did not provide regional level breakdowns of the national costs.

[3] The NZHIS is a government agency that collects data on all publicly-funded hospital discharges.

[4] Cases are coded using the International Classification of Diseases (ICD) is published by the World Health Organization. The ICD classifies (and codes) diseases and injuries according to symptoms, demographics, and identified causes of injury or disease.

[5] For this small scale project, we have not added four partially attributable conditions (diabetes, epilepsy, psoriasis, or spontaneous abortion) in Jones et al but not in Collins and Lapsley. We also note that three conditions across these two sources had different ICD10 code ranges (hypertensive diseases, cardiac arrhythmias and heart failure).

3 Health care costs of harmful alcohol use

We use National Minimum Data Set (NMDS) data to estimate the hospital costs related to alcohol use in New Zealand and for the Canterbury region.[6] Other health care costs are then calculated on a pro rata basis using the national-level estimates in Slack et al (2009).[7]

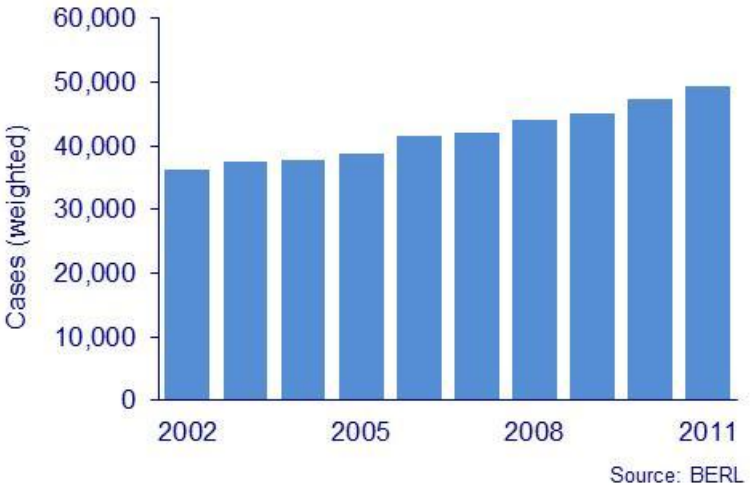
We begin by introducing the key national figures and then note our findings for Canterbury.

3.1 Alcohol-related hospital care and costs in New Zealand

BERL's (2009) analysis of alcohol-related hospital admissions ran to 2006.

Over the 5 year interval from 2006 to 2011, the number of weighted cases across the country as a whole rose by 18.4 percent, an average of 3.4 percent per annum (p.a.). Figure 3.1 shows the rising trend in the number of alcohol-related cases.

Figure 3.1 Number of alcohol-related hospital cases (weighted) in New Zealand

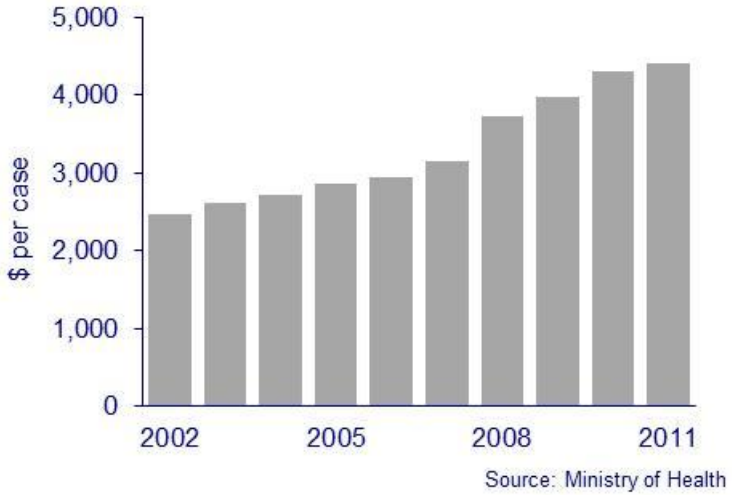


[6] We focus on facilities operated by the Canterbury District Health Board (agency codes 4121 and 4122).

[7] We reproduce the figures on the costs of harmful alcohol use and the costs to the nation's health system in an appendix for reference and context (see page 9).

The cost of an average publicly funded hospital case has increased substantially in recent years. Between 2002 and 2011, the unit cost of an average case has increased by 78 percent (in dollar terms); in the five years since 2006, the unit cost increased by 50 percent. Figure 3.2 shows how the cost per average case, set by the Ministry of Health, has risen.

Figure 3.2 Cost per average case (Ministry of Health)



The rising unit cost is partly due to the high profile constraints on the health labour force. This scarcity of resources, and the consequent rise in the cost of treating a patient, amplifies the rising trend in the number of alcohol-related cases and alcohol-related hospital costs.

The combined impact of more cases and higher unit costs increased the cost of alcohol attributable hospital care to the hospital system by 77 percent between 2006 and 2011.

3.2 Alcohol-related hospital cases in Canterbury

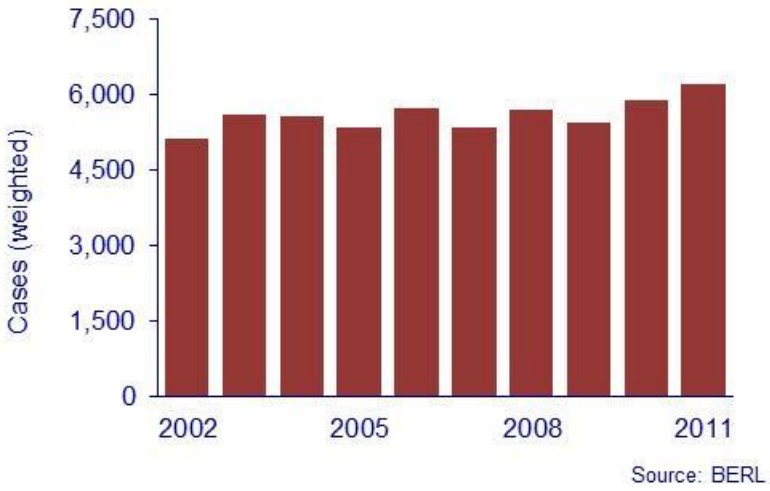
The number of people admitted to hospital in Canterbury where alcohol was a contributing factor has risen over the past decade. Around **19,180 people were admitted to Canterbury hospitals during 2011 where alcohol was a contributing factor**, having risen from 15,070 admissions in 2002 and 16,220 admissions in 2006.

To gauge how much alcohol contributed to a person's admission, we use alcohol attributable fractions (AAFs). The AAFs reflect whether alcohol was a partial or wholly contributing factor (see section 2.3). For example, a disease where half of the admissions are due to alcohol use has an AAF of 0.5. We refer to such admissions as an *alcohol attributable cases*.

These cases are weighted according to their cost and complexity before being aggregated. Converting the admissions numbers using this approach, around one third of the admissions were attributed to alcohol use. That is, **Canterbury had 6,211 alcohol attributable (weighted) cases in 2011.** The equivalent figures were 5,126 in 2002 and 5,371 in 2006.

Figure 3.3 shows how the number of alcohol attributable cases in Canterbury has changed between 2002 and 2011.

Figure 3.3 Number of alcohol-related hospital cases (weighted) in Canterbury



The number of alcohol attributable cases increased by 21 percent since 2002. This is almost twice the region's population growth of 10.7 percent over this period. This indicates that the increase is not simply due to population growth but also to changing behaviours.

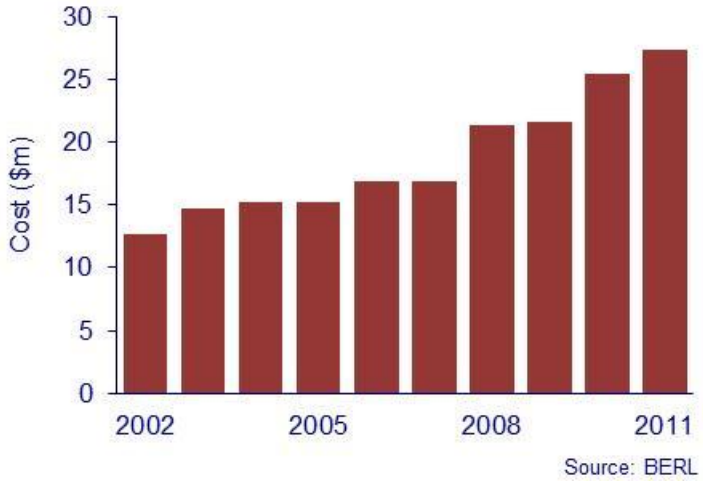
In noting that the number of cases has risen overall, in some years there have also been falls (in the order of 5 to 6 percent). Focussing on the 5 years since 2006, the number of cases rose by 8.4 percent (an average of 1.6 percent p.a.). This is less than half the overall national rate.

The more modest and mixed growth experienced in Canterbury has meant that this region has had to deal with a decreasing share of cases compared to New Zealand as a whole. The percentage of cases in Canterbury has dropped from a peak of 14.9 percent in 2003 to 12.6 percent in 2011.

3.3 Costs of alcohol-related health care in Canterbury

Hospital care for the estimated 6,211 **alcohol attributable cases cost $27.4 million in 2011**, up from $16.9 million in 2006 (5,371 alcohol attributable cases). The rising number of cases (8.4 percent) and treatment costs (50 percent) between 2006 and 2011 combined to increase hospital costs by $10.5 million (62.1 percent). Figure 3.4 tracks the cost to the hospital system of alcohol attributable cases in Canterbury, beginning in 2002.

Figure 3.4 Cost of alcohol attributable hospital cases (weighted) in Canterbury



The wider costs to Canterbury's health care system were $62.8 million in 2011 based on a pro rata calculation of the estimated hospital costs (above) to other health care costs estimated in BERL's (2009) study.[8] Table 3.1 breaks down these wider health care costs.

Table 3.1 Health care costs in Canterbury, 2006 and 2011 ($m)

Canterbury health care ($m)	2006	2011
Hospitals	16.9	27.4
Other medical	8.8	14.3
Treatment for victims of crime	13.1	21.2
Total	**38.8**	**62.8**

Source: BERL

For example, nationally, the cost of treatment for victims of crime was about three quarters (77 percent) as large as the estimate for hospital costs in 2006. Applying this percentage to the estimated $16.9 million cost to Canterbury's hospitals in 2006 indicates treatment for victims of crime in the Canterbury region would be in the order of $13.1 million.

[8]The pro rata relates to hospital costs that are solely attributable to alcohol use. This approach underestimates the total health care cost, as it does not include non-hospital health care costs due to multiple substance use.

3.4 Insights

This analysis highlights that alcohol cost Canterbury's hospital and other care systems in the order of $63 million in 2011, and this cost has grown substantially over the past decade. In addition to quantifying this issue, we can draw a couple of key insights.

- Rising treatment costs heighten the importance of reducing incidence (number of cases).
- Concerted effort is required to change behaviour to reduce harmful use of alcohol.
- This requires a multi-level response, from individual choices through to national policy.

Some individuals fail to make choices consistent with their own and other's long-term welfare. These choices impose costs on their own (future) self and on the wider society.

While some behaviours are harder to change, most individuals respond to incentives. From an economic point of view, an important lever to change behaviour is price. From a policy perspective, this lever – and any policy tool designed to influence it - needs to be handled with due consideration.

If the primary policy concern is to address harmful use that creates social costs, then a good policy tool would target just this group, rather than drinkers as a whole. A blunt policy, for example, that simply lifts the price of all alcoholic beverages could have undesirable spill-over effects. This is because not all consumers respond to price in the same way. The most responsive people are likely to be the price sensitive majority who are low risk users, with the result of throttling their enjoyment.[9] At the same time, those who are the most harmful users tend to be less responsive, and therefore this blunt policy would have a relatively minor effect on the target population while undesirably affecting non-harmful users.

The net effect may be to reduce social welfare, as the reduction in social costs is less than the reduction in benefits that were previously enjoyed by responsible drinkers.

In contrast, a regulated minimum price (per standard unit of alcohol) may be a tool that would more effectively target high volume consumers, with smaller spill-over effects. This assumes that high volume, high risk consumers purchase cheap alcohol. A higher price would discourage this group to the extent that they spend some of their limited on alcohol.

Some responsible drinkers may still be undesirably affected by an increase in the price of the cheapest alcohol. But, if the majority of responsible drinkers are purchasing higher quality (more expensive) products, then the minimum price is unlikely to materially affect them.

[9] Consumer responses to alcohol price changes are difficult to establish. A growing literature indicates that chronic drinkers are barely responsive to price changes, low drinkers are somewhat responsive, while moderate drinkers are the most responsive (Wagenaar et al 2009, University of Sheffield 2008, Gallet 2007, Manning et al 1995).

4 References

Begg S, Vos T, Barker B et al. (2007). The burden of disease and injury in Australia, 2003. Brisbane: University of Queensland.

Collins D and Lapsley H. (2008). The Costs of Tobacco, Alcohol and Illegal Drug Abuse to Australian Society in 2004/05. Canberra: Commonwealth of Australia.

Connor J, Broad J and Jackson R. (2005). The Burden of Death, Disease and Disability due to Alcohol in New Zealand. ALAC Occasional Publication No. 23.

Easton, Brian (2002) "Taxing harm: Modernising alcohol excise duties" A report commissioned by the Alcohol Advisory Council, November 2002.

English D, Holman C et al. (1995). The quantification of drug caused morbidity and mortality in Australia. 1995 ed. Canberra: Commonwealth Department of Human Services and Health.

Ezzati M, Lopez A, Rodgers A, Murray C, editors. (2004). Comparative Quantification of Health Risks: Global and Regional Burden of Disease due to Selected Major Risk Factors. Geneva: WHO.

Gallet C (2007). The demand for alcohol: a meta-analysis of elasticities. The Australian Journal of Agricultural and Resource Economics. 51: 121 – 135.

Jones L et al (2008). Alcohol Attributable Fractions for England. Alcohol-attributable mortality and hospital admissions. Report commissioned by the UK Department of Health.

Pidd K, Berry G, Roche A and Harrison J. (2006). Estimating the cost of alcohol-related absenteeism in the Australian workforce: the importance of consumption patterns. MJA 185 (11/12), 637-641.

Manning W, Blumberg L and Mouton L (1995). The Demand for Alcohol: The Differential Response to Price. Journal of Health Economics. 14: 23-148.

Rehm et al. (2004). Alcohol Use. In Ezzati et al. Comparative Quantification of Health Risks

Ridolfo B and Stevenson C. (2001). The quantification of drug-caused mortality and morbidity in Australia, 1998.

Single E, Collins D, Easton B, Harwood H, Lapsley H, Kopp P, and Wilson E. (2001, 2003). International Guidelines for Estimating the Costs of Substance Abuse. Geneva: WHO.

Slack A et al (2009). Costs of Harmful Alcohol and Other Drug Use. Report prepared by BERL for the Ministry of Health and ACC.

Slack A et al (2008). New Zealand Drug Harm Index. Report prepared by BERL for the New Zealand Police.

University of Sheffield (2008). Independent review of the effects of alcohol pricing and promotion.

Wagenaar A et al (2009). Effects of beverage alcohol price and tax levels on drinking: a meta- analysis of 1003 estimates from 112 studies. Addiction. 104: 179 – 190.

A1 Appendix – Canterbury hospital admissions breakdown

Table 4.1 Number of hospital admissions by condition, Canterbury (2006 and 2011)

Conditions	ICD-10 code	Case-weight sum 2006	2011
Wholly attributable to alcohol use			
Alcohol dependence/abuse	F10.0-10.2	164.5	207.3
Alcohol-induced pseudo-Cushing's syndrome	E24.4	0.0	0.0
Alcoholic beverage & other EtOH poisoning	X45, Y15, T151.0-151.1, T51.9	9.0	6.4
Alcoholic cardiomyopathy	I42.6	0.0	3.0
Alcoholic gastritis	K29.2	4.5	8.3
Alcoholic liver cirrhosis	K70	43.9	55.5
Alcoholic myopathy	G72.1	1.4	2.6
Alcoholic poly-neuropathy	G62.1	0.0	0.0
Alcoholic psychosis	F10.3-10.9	89.7	52.4
Degeneration of nervous system due to alcohol	G31.2	1.0	2.9
Fetal alcohol syndrome (dysmorphic)	Q86.0	excluded from update	
Sub-total		**314.0**	**338.5**
Partially attributable chronic conditions			
Cholelithiasis	K80	0.0	0.0
Female breast cancer	C50	22.2	27.9
Gastro-oesophageal haemorrhage	K22.6	13.7	9.2
Heart failure	I50-51, I97.1	4.1	4.2
Hypertension	I11, I13.0, I15	0.6	0.0
Ischaemic heart disease	I20-25	0.0	0.0
Laryngeal cancer	C32	19.9	21.2
Liver cancer	C22	23.7	25.5
Oesophageal cancer	C15	31.3	32.1
Oesophageal varices	I85, I98.2	3.1	3.6
Oropharyngeal cancer	C00-C14	44.4	38.2
Pancreatitis - acute/chronic	K85, K86.0-86.1	113.1	101.6
Stroke - haemorrhagic/ischaemic	G45, I60-69	28.5	25.0
Supraventricular cardiac dysrhythmias	I47.1, I47.8-48.9	0.0	0.0
Unspecified liver cirrhosis	K74.3-74.6, K76.0, K76.9	2.2	2.7
Partially attributable acute conditions			
Air transport accidents	V codes, refer to source	6.4	6.1
Child abuse & Assault	X85-Y09, Y87.1	166.9	214.0
Fall injuries	W00-19, M80-82	1,116.5	1,273.2
Fire injuries	X00-19	22.9	15.2
Injury or adverse effects from treatment		1,350.1	1,538.8
Motor vehicle injuries - non-traffic		53.3	64.4
Motorcycle rider injuries - non-traffic		29.1	58.2
Occupational and machine injuries		406.4	522.8
Pedal cyclist injuries - non-traffic	V codes, refer to source	13.3	18.8
Pedestrian accidents		38.3	4.2
Road injuries		435.3	404.0
Suicide and Self Injury		228.3	129.3
Surgical operation (Y83)		1,233.8	1,326.0
Water transport accidents		9.5	5.9
Sub-total		**5,416.8**	**5,872.2**
Total		**5,730.7**	**6,210.6**

Source: NZHIS, BERL.

A2 Appendix – National costs of harmful alcohol use

A2.1 Costs of harmful alcohol use in New Zealand in 2005/06

BERL (2009) estimated the costs of harmful alcohol and other drug use to New Zealand during 2005/06. This report estimated that harmful alcohol use caused $2.875 billion of tangible (resource) social costs, and $1.562 billion of intangible (non-resource) costs.

Table 4.2 Costs of harmful alcohol use in New Zealand, 2006 ($m)

New Zealand (2005/06 $m)	Tangible	Intangible
Labour (lost production)	1,821	
Crime n.i.e.	562	
Health care	290	
Other	202	
Total	**2,875**	**1,562**

Note: n.i.e. = not included elsewhere

Source: BERL

Table 4.3 breaks down the health care cost figure of $290 million into its component categories. The largest category is hospital care for the treatment of chronic and acute conditions ($126 million or just over 40% of the social costs of alcohol related health care). Treatment for the victims of alcohol-related crime is identified separately; most victims suffered injuries as a result of violent offences. Other medical care includes A&E/non-admitted hospital treatment, ambulances, primary care and pharmaceuticals.

Table 4.3 Health care cost breakdown for New Zealand, 2006 ($m)

New Zealand health care	$m
Hospitals	126
Other medical	66
Treatment for victims of crime	98
Total	**290**

Source: BERL

A3 Appendix – Methodology overview

This section briefly outlines key elements of the method used in the study. This research uses the framework applied by Slack et al (2009) to estimate the social costs of harmful alcohol and other drug use in Canterbury. That report, and an earlier report on the harm from illegal drugs (BERL 2008a), comprehensively outlines the methodology and literature.

A3.1 Harmful use

Harmful alcohol use imposes a net social cost.[10] While the threshold for harmful use is controversial, we anchor our definition in the epidemiological literature and with reference to previous drug abuse cost studies (English et al 1995, Ezzati et al 2004, Rehm et al 2004, Connor et al 2005). The thresholds for harmful use are typically expressed in terms of daily consumption. However, actual use may be substantially higher than these thresholds, and may be concentrated in binge drinking, which tends to exacerbate the harm.

This study defines harmful alcohol use as a "hazardous" or "high risk" drinking pattern (English et al 1995, Rehm et al 2004, Connor et al 2005).[11,12] Table 4.4 below reports the drinking pattern thresholds, in grams per day, used in this study. They allow for different impacts by gender, and are based on population average levels.

Table 4.4 Drinking pattern thresholds by gender, grams of alcohol per day

Grams of alcohol per day	Women	Men
Abstinent	0.0	0.0
Low risk	0-19.99	0-39.99
Hazardous	20-39.99	40-59.99
High risk	40+	60+

Source: Connor et al (2005)

[10] Epidemiological literature and previous drug abuse cost studies were used to determine thresholds for harmful AOD use (English et al 1995, Ezzati et al 2004, Rehm et al 2004, Connor et al 2005). This study defines harmful alcohol use as average daily consumption of alcohol per day over 20 grams for women and 40 grams for men.

[11] The average daily consumption ranges are consistent with the WHO categories (Rehm et al 2004), the Australian alcohol guidelines (NHRMC 1992), Australian epidemiological and substance abuse studies (English et al 1995, Pidd et al 2006, Collins and Lapsley et al 2008) and a recent New Zealand study on the burden of death, disease and disability due to alcohol (Connor et al 2005).

[12] These patterns are notional concepts that are derived from aggregated population information and used in a wide variety of social cost estimation studies. However, these levels should not be interpreted as individual consumption guidelines. ALAC provides guidance and advice on individual alcohol consumption levels that are likely to minimise risk. http://www.alac.org.nz/LowRiskDrinking.aspx?PostingID=963

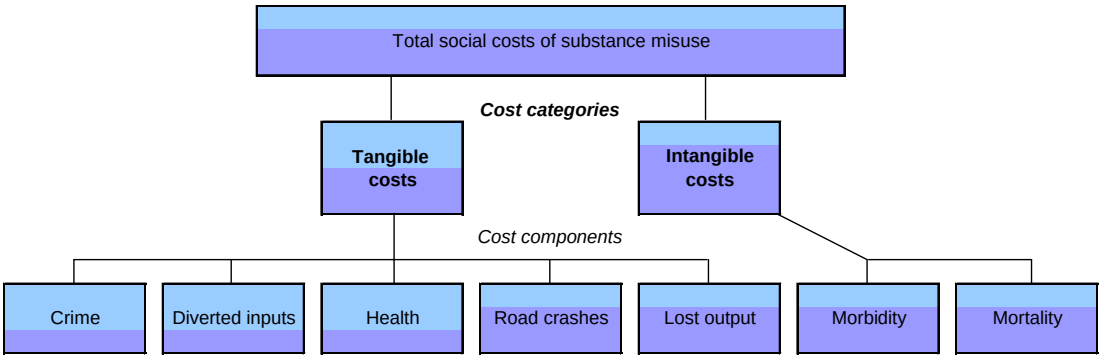
Low risk drinkers, such as social drinkers, are assumed to have no harmful alcohol use, unless specific information to the contrary was found. For example, the analysis includes harms resulting from road crashes, hospitalisations, workplace absenteeism or criminal offences involving low-risk drinkers, as these incidents are captured in the data sources used for this study.

As this study concentrates on the impacts from harmful use, it excludes the potential health benefits or psychological benefits to the users.[13] As such, while conditions such as ischaemic heart disease or cholelithiasis (gall stones) may be reduced by moderate alcohol consumption, it does not include such impacts as offsets to harmful use from other alcohol use; nor do we attempt to impute the harmful component for those conditions where there use is determined to be (net) beneficial.[14]

A3.2 Cost categories

The broad categorisation of costs below is common across the major harmful substance use cost studies, and Single et al (2001, 2003) acts as a landmark reference for it. The two broad cost categories are tangible (or productive resource) costs and intangible (welfare) costs. These include crime, inputs diverted to drug production, health care costs, road crash costs, lost output (which is sometimes referred to as lost productivity) and selected dimensions of quality of life and loss of life.

Figure 4.1 Cost categories, components and analytical focuses



[13] In the case of alcohol, there is epidemiological debate about the existence and magnitude of any health benefits from any level of alcohol consumption. For example, Begg et al (2007) and Connor et al (2005) estimate some positive impacts of alcohol consumption for particular age groups and health conditions. But Lindberg and Amsterdam (2008), Fillmore et al (2007) and Fillmore et al (2006) contest the evidence base of the health benefits of alcohol, and suggest that it is not currently possible to conclude that alcohol is a causal factor for good health.

[14] We use Collins and Lapsley's (2008) conditions and attributable fractions in our estimates of AOD-related hospital use and mortality rates. We add alcohol-induced pseudo-Cushings disease, degeneration of the nervous system due to alcohol, and alcoholic myopathy, which by definition are conditions wholly attributable to alcohol use.

The Collins and Lapsley fractions indicate some alcohol use may be beneficial for some conditions. We concentrate on harmful drug use, and assume zero fractions for such conditions.

The colours suggest possible alternative analytical focuses, for example, a focus on total costs (light blue plus purple) or on avoidable costs (purple only). Avoidable costs are the portion of total costs that may be avoided by reduced harmful substance use through treatment and preventive interventions. The remaining costs, shown in light blue, represent costs that are likely to persist in spite of policy interventions. Other focuses might concentrate on who bears the costs, or costs due to particular types of harms such as injury.

Accurately costing of harmful substance use needs to take into account two further issues, discussed in section A3.2.3. The first relates to co-morbidity costs, that is, costs which are exacerbated by the misuse of a substance. The second issue relates to jointly attributable costs, that is, costs that are associated with the use of multiple substances.

A further caveat is that despite the wide range of costs included in the major harmful substance use cost studies, some components are not estimated due to a lack of data about the distribution of risk factors or the association between a risk factor and an outcome. These include costs such as environmental damage or a broad concept of lost wellbeing.

A3.2.1 Tangible costs

A tangible cost can be either a direct cost or an indirect cost, depending on whether it is an explicit cost or an opportunity lost due to harmful substance use.

The largest direct costs due to the misuse of alcohol or other drugs in dollar terms (Collins and Lapsley 2008, BERL 2008) include:[15]

- crime costs caused by harmful drug use
- resources diverted from beneficial consumption or investment to drug production
- road crashes
- health care costs.

Indirect costs refer to potential resources or output that is not generated as a result of misuse. These costs may be borne by individuals or third parties such as employers. The primary indirect costs of AOD are:

- production lost to the economy as a result of premature death of users of AODs
- production lost to the economy as a result of an injury or disability to users of AODs

[15] These components may also involve indirect and intangible costs. For example, in addition to health care related to road crashes, time off work would be counted as an indirect cost, while lost quality of life or loss of life would be measured as an intangible cost.

- reduced production by those who are disabled, for example, due to the ill effects of harmful drug use or AOD-related road crashes
- reduced production by family members and friends who take care of those who are ill as a result of harmful drug use. However, estimation of these costs would require information on the quantum and value of time involved. This cost is not estimated.

A3.2.2 Intangible costs

Intangible costs are welfare impacts borne by individuals that "cannot be shifted" (Collins and Lapsley 2008). Intangible costs harm the individual but any reduction in harm cannot be transferred to benefit other members of society.

In the case of AOD, intangible costs include:

- premature death among users as a result of AOD misuse
- reductions in the quality of life among users due to pain, disability and lost wellbeing caused by AOD misuse.

A further step is to convert the total intangible cost measured in natural units such as quality-adjusted life years (QALYs) to dollar terms using an appropriate value statistic, such as a value of statistical life (VOSL). [16]

A3.2.3 Co-morbidities and jointly attributable costs

Two further methodological issues involve how to account for co-morbidities and impacts that are jointly attributable to multiple substance use. The treatment of these issues is addressed in BERL's previous reports, so we only note why these are potential issues here.

Co-morbidity costs are not primarily caused by the misuse of a substance but may be exacerbated by it. In addition, co-morbidities may be exacerbated by joint AOD use when the substances interact. Where these costs are ignored, they will lead to an underestimate. The 2009 study separated alcohol or other drug costs where possible, and reported joint AOD costs where a cost could not always be clearly attributed to either alcohol or to other drugs. The detail in NMDS data allowed alcohol- and other drug-related treatment to be isolated and analysed separately, with no joint AOD hospital-related costs.

[16] QALYs are a summary measure of health-related morbidity and mortality: a higher QALY measure represents greater wellbeing.

A4 Alcohol-attributable health conditions

The following list of ICD-10-AM 1st edition codes was used to assess drug-attributable hospital admissions. Data were supplied by the NZHIS on Deaths Registration data (Tables A and E) and Publicly Funded Hospital Discharges data (Tables A, B or V).

Table 4.5 Alcohol-attributable morbidity and mortality health conditions

Condition	ICD-10 code(s)	Source†
Wholly attributable to alcohol use		
Alcohol dependence/abuse	F10.0-10.2	C&L
Alcohol-induced pseudo-Cushing's syndrome	E24.4	Jones et al
Alcoholic beverage & other EtOH poisoning	X45, Y15, T151.0-151.1, T51.9	C&L
Alcoholic cardiomyopathy	I42.6	C&L
Alcoholic gastritis	K29.2	C&L
Alcoholic liver cirrhosis	K70	C&L
Alcoholic myopathy	G72.1	Jones et al
Alcoholic poly-neuropathy	G62.1	C&L
Alcoholic psychosis	F10.3-10.9	C&L
Degeneration of nervous system due to alcohol	G31.2	Jones et al
Fetal alcohol syndrome (dysmorphic)	Q86.0	C&L
Partially attributable to alcohol use		C&L
Child abuse & Assault	X85-Y09, Y87.1	C&L
Cholelithiasis	K80	C&L
Fall injuries	W00-19, M80-82	C&L
Female breast cancer	C50	C&L
Fire injuries	X00-19	C&L
Gastro-oesophageal haemorrhage	K22.6	C&L
Heart failure	I50-51, I97.1	C&L
Hypertension	I11, I13.0, I15	C&L
Ischaemic heart disease	I20-25	C&L
Laryngeal cancer	C32	C&L
Liver cancer	C22	C&L
Occupational and machine injuries	V codes, refer to source*	C&L
Oesophageal cancer	C15	C&L
Oesophageal varices	I85, I98.2	C&L
Oropharyngeal cancer	C00-C14	C&L
Pancreatitis - acute/chronic	K85, K86.0-86.1	C&L
Road injuries	Subset of V codes, refer to source	C&L
Self-harm or accidental harm		C&L
Stroke - haemorrhagic/ischaemic	G45, I60-69	C&L
Supraventricular cardiac dysrhythmias	I47.1, I47.8-48.9	C&L
Unspecified liver cirrhosis	K74.3-74.6, K76.0, K76.9	C&L

* We re-categorise this set of codes as per Jones et al, as they include a very range of injuries and accidents.

† C&L = Collins and Lapsley (2008); Jones et al = Jones et al (2008).