Overview of positive and negative effects of alcohol consumption – implications for preventive policies in Canada

J. Rehm, N. Giesbrecht, S. Popova, J. Patra, E. Adlaf, & R. Mann
Centre for Addiction and Mental Health, Toronto, Canada

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Executive Summary

In recent years there has been growing evidence of harm from alcohol, as well as acknowledgement of the health benefits for some consumers of moderate consumption. This paper examines both, focusing on the international literature and recent evidence from Canada.

The Global Burden of Disease study by the World Health Organization (2002) indicates that in developed countries, including Canada, alcohol is considered to contribute to a substantial share of overall mortality, disease and disability. It is one of the leading contributors to disability-adjusted life years (DALYs), estimated at 9.2% from alcohol, compared to 12.2% for tobacco, and 10.9% blood pressure, and higher than cholesterol, overweight, low fruit and vegetable intake, and physical inactivity. This finding, along with other research, has provided a basis for a 2005 WHO General Assembly resolution promoting evidence-based policies and interventions to control the damage from alcohol (World Health Assembly, 2005). The findings and recommendations of this report are congruent with the WHO study and this resolution.

The purpose of this report is to provide an overview of the positive and negative health, psychological and social outcomes attributable to alcohol consumption in Canada. It also provides separate estimates by different socio-demographic categories, and subsumes the alcohol specific outcomes into a larger framework of determinants of health. It concludes with a summary of evidence-based prevention strategies.

The relationship between alcohol consumption and health and social outcomes is complex and multi-dimensional. Intoxication, dependence and direct biological effects are three intermediate mechanisms by which alcohol consumption is linked to long-term health and social consequences. Furthermore, overall consumption rates and patterns of drinking in a population

– such as frequency of heavy consumption occasions, have been linked with both traumatic damage from alcohol (e.g. violence, accidents, suicide, homicide) and chronic effects.

Alcohol has the highest prevalence of consumption in the Canadian population among psychoactive substances. The vast majority of adult Canadians (almost 80% of the population aged 15 and above) consumed alcohol within the last year, as indicated by a recent survey. About 21% of adult Canadians reported drinking above the low risk drinking guidelines, and just under 12% had an elevated score on Alcohol Use Disorders Identification Test (AUDIT).

There is a strong association between high risk drinking and drinking related damage that is evident across gender, all age groups and socio-economic strata. Nevertheless, there are some important nuances: the distribution of alcohol-attributable consequences does not seem to be the same for different socio-economic strata. Canadians with less formal education and lower available income experience disproportionately more harm from alcohol consumption. At this time there are only preliminary hypotheses to explain this relationship, such as differences in drinking styles, victimization by social status, or protective effects associated with access to more resources.

While alcohol consumption is linked to beneficial and detrimental health and social consequences, the net health consequences are overwhelmingly detrimental. It is estimated that 6.2% of all deaths among those under age 70 were due to alcohol in Canada in 2002. The health benefits are mainly restricted to cardiovascular protective effects of light to moderate drinking which occurs only in older age groups.

Overall, alcohol consumption was estimated to be responsible for 8,103 deaths (females 2,360; males 5,744[1]), but also prevented 3,845 deaths (females 1,595; males 2,250) in Canada for the year 2002. It was also responsible for 191,136 years of life lost (50,360 in females, 140,776 in males) in that year, with major implications for the health care system as well as social effects. The chronic alcohol-attributable effects include a number of types of cancers, cardiovascular diseases, gastrointestinal disorders, liver cirrhosis and others.

Alcohol consumption was estimated to be responsible for 1,587,054 hospitals days (females 556,343; males 1,030,711) in 2002. It was estimated that 340,109 hospital days were avoided by alcohol consumption (females 128,463; males 211,647) – that is, the benefits of moderate consumption are estimated to have prevented hospital visits that otherwise might have occurred.

The net health consequences in terms of mortality from alcohol consumption are detrimental for all age groups except for people 80+. In 2002, the overall net loss from alcohol in mortality and morbidity was estimated to be 4,258 deaths (females 764; males 3,494), and 1,246,945 hospital days (females 427,880; males 819,065) in Canada. Most of the potential deaths estimated to be prevented by alcohol were from coronary (ischaemic) heart disease (2,951 deaths) and almost 80% of these prevented deaths were after age 70. For those younger than 70 years of age, 4,115 of all net deaths in Canada 2002 were attributed to alcohol, accounting for 3,160 men and 955 women. This represents 6.2% of all Canadian deaths in this age group.

The social costs resulting from alcohol use in Canada in 2002 amounted to $14.6 billion, which about half of these costs resulting from productivity losses.

[1] Please note, that these are estimates, and thus due to rounding numbers of subcategories may not exactly add up to the total or to 100%.

The psychological and social consequences of alcohol consumption may also be beneficial as well as detrimental. While alcohol is responsible for beneficial effects with respect to perceived health, mood enhancement, stress reduction, sociability, social integration, and mental health, there are detrimental consequences with respect to public disorder, workplace, education, family and social relations, violence (including domestic violence) and criminality. Unfortunately, there is no common methodology to allow for quantitative comparison of social positive and negative effects from alcohol.

Several caveats should be noted. Surveys of drinking behaviour in Canada and elsewhere only account for a proportion of the actual consumption as estimated by alcohol sales and production. In the 2004 Canadian Addiction Survey, only about one third of the estimated consumption was accounted for – this is likely due to forgetting, underestimating and other factors, but there is no evidence that this underestimation varies substantially by sex, age or social status of the respondent. Therefore, determining exposure to alcohol using this method is an imperfect measure. Nevertheless, there is strong face validity – that is, countless studies have demonstrated a strong positive relationship between self-reported consumption patterns and damage from alcohol; those who drink more and in a risky manner tend to experience more harm from alcohol.

The estimates of the health benefits may be inflated, since relative risk of alcohol from ischaemic heart disease, linked with benefits from alcohol consumption, declines with age. However, the same relative risks have been used for all age groups. Future research using age-specific estimates of relative risk could result in dramatically reduced estimates of the beneficial effects of alcohol.

In general, a conservative approach was taken in these analyses, and therefore the estimates of alcohol-attributable mortality and morbidity are likely conservative numbers. Only those disease outcomes found to be linked to alcohol by biological and epidemiological research were included in the analysis. Those with borderline significant effects or no effects were excluded.

There are evidence-based interventions to reduce the negative effects of alcohol consumption in Canadian society. The recommendations in this report are based on extensive international research involving hundreds of evaluations summarized in a WHO sponsored project (Babor et al. 2003). Many of these interventions can be applied with no expected reduction of the positive effects related to moderate alcohol consumption. Overall, governmental interventions (e.g. taxation, drinking driving laws and their enforcement, low density of retail outlets) are to be considered the most cost-effective with respect to alcohol-attributable harm (Babor et al. 2003). However, our analyses also indicate that future research and interventions should pay increased attention to determinants of health. For instance, individuals with a lower socio-economic status who engage in risky drinking patterns are associated with more alcohol-attributable harm compared to drinkers with higher socio-economic status engaging in the same drinking behaviours.

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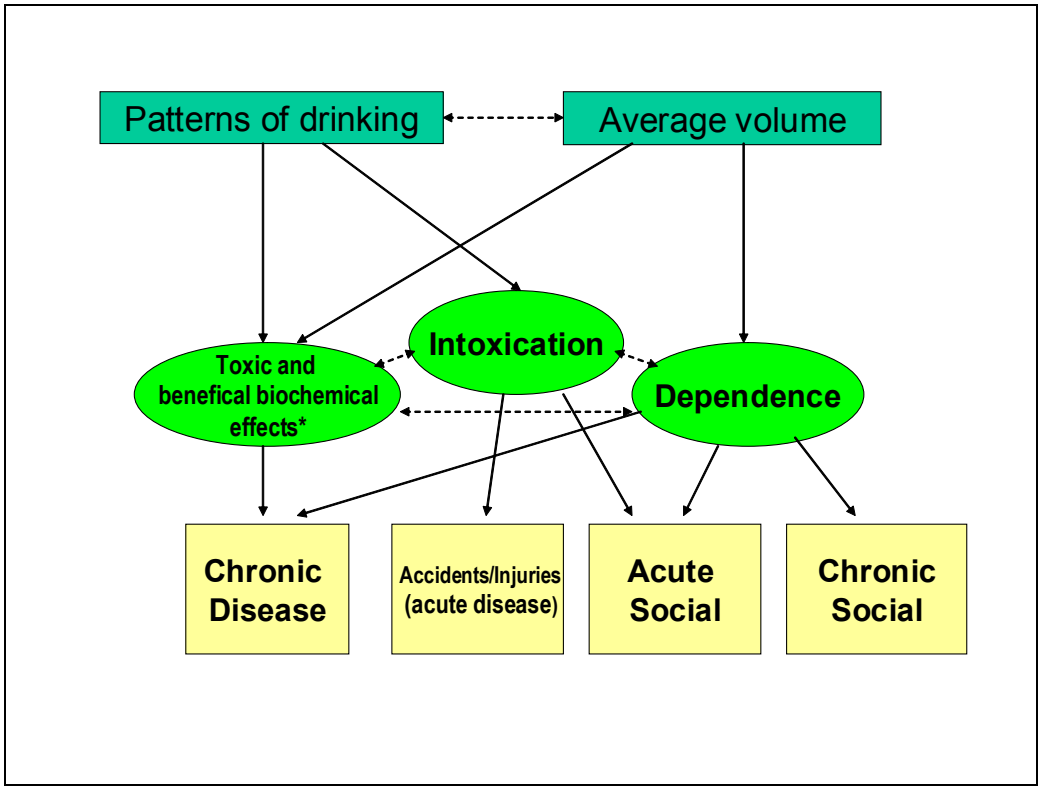
1) Introduction

A conceptual model of alcohol use and harm

The relationship between alcohol consumption and health and social outcomes is complex and multidimensional. As shown in Figure 1.1, alcohol consumption is linked to long-term health and social consequences through three intermediate mechanisms: intoxication, dependence and direct biological effects. For instance, intoxication resulting from drinking may be causally implicated in traffic injury or in an episode of violence that leads to arrest and punishment. Alcohol dependence resulting from drinking, through promoting and reinforcing further drinking, may lead to the onset of liver cirrhosis or result in family disruption. Examples of biological effects of drinking include both beneficial effects on health such as promotion of blood clot dissolution and detrimental effects on health such as the long-term toxicity on the liver. Figure 1.1 provides only the main causal pathways. Indirect consequences are not included. For example, this model does not cover the situation where a drunk driver kills somebody and, due to the emotional impact of this event on the drunk driver, he or she loses employment and becomes socially marginalized. In this example, the model covers the effects of alcohol on acute consequences (i.e., the driving accident), but does not cover the subsequent loss of employment and social marginalization.

Figure 1.1: Conceptual model of alcohol consumption, intermediate mechanisms, and long-term consequences (cf. Rehm et al., 2003b; Babor et al., 2003)



* Independent of intoxication or dependence

Chronic and acute diseases attributable to alcohol are listed in detail below. An example of an acute social consequence would be a husband beating up his wife while intoxicated or criminal activity linked to intoxication (i.e. events not being committed otherwise). (See psycho-pharmacological model below of the relation between alcohol consumption and criminality see Goldstein, 1985). Unemployment can be a consequence of alcohol problems and thus could be an example of a chronic social consequences.

The three intermediate mechanisms can be further described as follows:

1. **Toxic and beneficial biochemical effects of alcohol.** Direct biological effects of alcohol may influence chronic disease in either beneficial or harmful ways. Accepted beneficial effects include the influence of moderate drinking on ischaemic heart disease, via reduction of plaque deposits in arteries, protection against blood clot formation and

promotion of blood clot dissolution (Zakhari, 1997). Examples of harmful effects include increasing the risk for high blood pressure, direct toxic effects on acinar cells triggering pancreatic damage (Apte et al., 1997) or hormonal disturbances (Emanuele & Emanuele, 1997).

2. **Intoxication.** Alcohol intoxication is a powerful mediator mainly for acute outcomes, such as accidental or intentional injuries or deaths, although intoxication episodes can also be implicated in chronic health and social problems and in certain forms of heart disease. The subjective feeling of intoxication is mainly due to the effects of alcohol on the central nervous system. These effects are felt and can be measured even at consumption levels that are light to moderate (Eckardt et al., 1998).
3. **Dependence.** Alcohol dependence is a clinical disorder. It is also a powerful mechanism for sustaining alcohol consumption and mediating its impact on both chronic and acute physiological and social consequences of alcohol (see Drummond, 1990).

Objectives and structure of the report

This report has the following objectives:

- Provide an overview of positive and negative health, psychological and social outcomes attributable to alcohol consumption in Canada, using the same methodology for both positive and negative consequences
- Provide separate estimates by different socio-demographic categories
- Subsume the alcohol-outcome relations into a larger framework of determinants of health
- Provide conclusions given the current situation in Canada with a focus on potential intervention strategies and practices, taking into consideration the evidence-base of these strategies.

This report is structured as follows. In Chapter 2, we describe the consumption of alcohol and some consequences as assessed by the most recent representative Canadian survey (Canadian Centre on Substance Abuse, 2004). Chapter 3 looks at the relationship between alcohol and health (see also Rehm et al., 2003b). The main contribution of this chapter is an

overview table on alcohol and disease categories as defined by the International Classification of Diseases (ICD). Chapter 4 will look into the balance of alcohol-attributable morbidity, years of life lost and mortality in Canada for the year 2002. Chapter 5 will look into the criminality causally associated with alcohol. Chapter 6 gives an overview of social costs related to alcohol. In chapter 7, we examine the psychosocial benefits of alcohol, and finally, chapter 8 offers policy conclusions based on the materials presented in earlier chapters.

Consistent with the framework illustrated above, and based in part on the **C**omparative **R**isk **A**nalysis (CRA) within the Global Burden of Disease Study (Murray et al., 2001; Ezzati et al., 2002, 2004; Mathers et al., 2002; WHO, 2002; Rehm et al., 2004), two dimensions of alcohol exposure were distinguished in all chapters: average volume of alcohol consumption and patterns of drinking. **Average volume of consumption** is a measure commonly used in epidemiology of alcohol exposure (Bruun et al., 1975), and has been linked to more than 60 disease conditions in a series of recent meta-analyses following the seminal work of English and colleagues (1995; see Chapter 3). **Patterns of drinking** have been linked mainly to two categories of disease outcome: acute effects of alcohol (e.g., accidental and intentional injuries) and cardiovascular outcomes, mainly ischaemic heart disease. In many analyses, including the CRA, patterns of drinking have been mainly defined in terms of heavy drinking occasions, drinking in public settings, and the proportion of drinking that occurs outside of meals (for further details see Rehm et al., 2004). Evidence with respect to differential effects of different beverages on traumatic and chronic damage is not conclusive. Since most analyses show no or very minor beverage-specific effects[2], this topic will not be discussed further in this report.

[2] See e.g. Rimm et al., 1996; Rehm et al., 2003c for overviews with respect to the beverage differences and ischaemic heart disease (IHD), the topic which received most attention over the past years ("red wine" hypothesis). The view, that beverage differences do not strongly impact IHD is also supported by the relative importance of the different pathways, which link moderate consumption to lower IHD risk (see Rimm et al., 1999 ; Puddey et al., 1999).

2) Alcohol consumption in Canada in a population health framework – who drinks and who suffers alcohol-attributable consequences?

Consistent with previous Canadian surveys, the 2004 Canadian Addiction Survey (CAS) (Adlaf, Begin & Sawka, 2005) revealed that alcohol is used by an overwhelming majority of Canadians, and is the psychoactive substance most commonly used. In the 12 months before the survey, 79% of Canadians aged 15 or older had consumed alcohol, 14% were former drinkers and 7% had been lifetime abstainers. While there was some regional variation, with the lowest rates of past-year drinking observed in Prince Edward Island (70%) and the highest in Quebec (82%), no difference in rates was observed in terms of rural versus non-rural residence.

The rate of past-year drinking was significantly higher among males than females (82% vs 77%, respectively). Past-year drinking increased according to level of education and income so that the rates of consuming at least one drink in the past year were highest among those with a university degree (84%) and in the highest income bracket (89%).

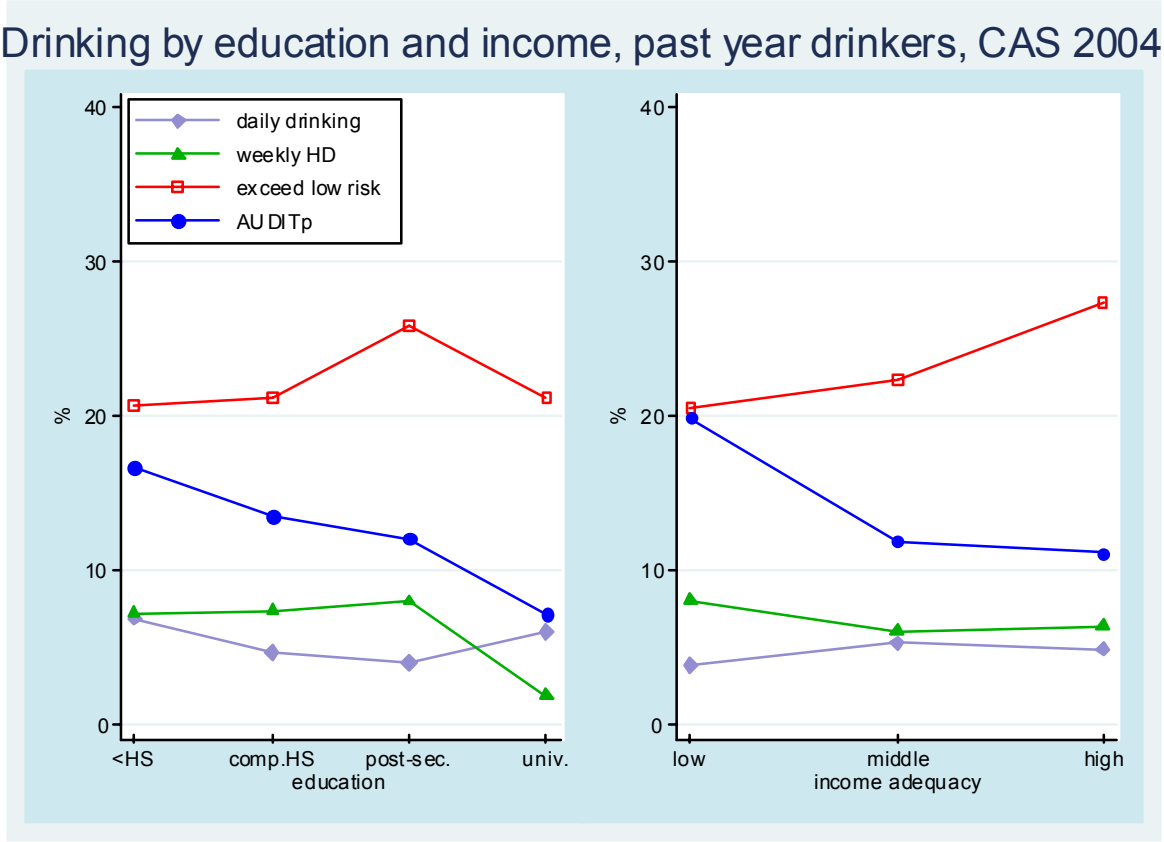
Furthermore, the proportion of people exceeding the level of drinking prescribed by the Low-Risk Drinking Guidelines (LRDG; see Appendix; Bondy et al., 1999) increased with higher social class (Figures 2.1 and 2.2)[3]. Patterns of alcohol consumption not consistent with the LRDG have been shown to be linked with negative consequences (Bondy et al., 1999). Despite this general finding, the CAS demonstrates that alcohol-attributable problems -- as measured with

[3] This proportion is most likely a low estimate. The CAS survey underestimated the real consumption in Canada by more than 60% (Rehm et al., in press). Real consumption in this context is operationalized by the *per capita* consumption measure, as measured by sales, production and unrecorded consumption (Rehm et al., 2003a; Gmel & Rehm, 2004) and amounted in Canada to 10.26 litres of pure alcohol per person 15+ in 2002 (World Health Organization, 2004). While the total amount of alcohol use is grossly underestimated in the CAS, we do not believe that there is differential underestimation by socioeconomic status, either measured by education or by income.

the Alcohol Use Disorders Identification Test (AUDIT; see Saunders et al., 1993; Allen et al., 1997) problem score[4] -- decrease the higher the social class.[5]

Figure 2.1: Drinking indicators and alcohol-attributable problems in past year drinkers in Canada by level of education, 2004 (left figure below)

Figure 2.2: Drinking indicators and alcohol-attributable problems in past year drinkers in Canada by income 2004 (right figure below)



Where:

Daily drinking: Consumption of at least one drink of alcohol per day

Weekly HD: At least one heavy drinking occasion per week, where heavy drinking was defined by the consumption of 5 or more drinks per occasion

Exceed low-risk: People exceeding the Low-Risk Drinking Guidelines

[4] The AUDITp problem score is a score derived from the 7 problem items of the AUDIT, i.e. it excludes the 3 consumption items.

[5] Although the data presented in Figures 2.1 and 2.2 are crude percentages, the relationships displayed still hold after adjusting for age. It is also important to note that the inverse association between alcohol harms and education and income adequacy were not evident in the CAS Detailed Report (Table 4.3, pg. 44). However, our outcomes differ in that the AUDITp items reflect a stronger indication of dependence and abuse than do the more general harms items. We should also note that in the CAS Detailed Report, education and income were not always statistically significant, although issues of collinearity may pose difficulties in assessing statistical importance. In any event, the pattern of the association between alcohol outcomes and education and income are similar to our analysis.

AUDITp: People with scores on the AUDIT Problem Score of more than 3 (range of score 0-28); the AUDIT problem score is a score derived from all the problem items of the AUDIT, i.e. it excludes the items which are only concerned with consumption *per se*

Nevertheless, on the individual level, higher volume and heavier patterns of alcohol consumption are correlated with negative outcomes from alcohol use. Indeed, the correlation between the frequency of drinking 5 and more drinks on one occasion and the AUDIT problem score is 0.50 and highly statistically significant – heavy drinkers are more likely to report problems.[6] Similarly, there is a strong relationship (tetrachoric correlation of 0.56) between the dichotomous variables of exceeding the Low-Risk Drinking Guidelines (LRDG) (21.1% exceeding) and having more than 3 points on the 28 point problem AUDIT sum score (11.7% in the Canadian population are above this threshold).[7] Those who exceeded the LRDG were likely to have a higher problem score.

How can this apparent paradox be explained? Overall, the results clearly confirm the literature: Drinking in excess of moderation is linked to alcohol-attributable problems on the individual level. This relationship is evident in Canada as well as elsewhere, and it is a relatively strong relationship.

However, other variables are influencing this relationship as well. In lower socio-economic strata, we see a lower proportion of past year drinkers that exceed the LRDG but a higher proportion of past year drinkers reporting drinking related problems. In the socio-economic group with the highest income, we have the highest proportion of people exceeding the Low-Risk Drinking Guidelines but the lowest proportion of alcohol-attributable problems. In the lower

[6] This conclusion is based on calculations of CAS data using population weighted analysis with N = 10,696 past year drinkers who answered to both respective survey questions.
[7] This conclusion is based on calculations of CAS data using population weighted analysis with N = 10,421 past year drinkers who answered to both respective survey questions).

socio-economic strata the impact of risky alcohol consumption patterns on alcohol-attributable problems appears to be greater. Conversely, in the higher socio-economic strata it appears that the protective effects associated with affluence might diminish the impacts of consumption on alcohol-attributable problems.

Among people with lower SES, there are other potential reasons for more problematic consequences of drinking. They include:

- different and more problematic drinking patterns among the poor -- not captured by the current measures such as exceeding the Low-Risk Drinking Guidelines or 5+ drinking frequency (Cahalan & Room, 1974, p. 152);
- more problematic behaviour while drinking (particularly among youth, more likely to be represented disproportionately in the poorer group);
- differential reaction of others to the drinking may enhance the problematic consequences of drinking (Cahalan & Room, 1974);
- less insulation from those who might object to heavy drinking.

These points illustrate themes for an exhaustive discussion of this topic, which is beyond the scope of this summary report. Further in-depth analysis, including analysis on longitudinal data sets, is needed. It is important to note that the associations summarized above – here specifically applied to the field of alcohol use - is consistent with a large body of research from Canada and elsewhere that points to the importance of the social determinants of health, such as socioeconomic status, income and education, mortality rates, and lifespan in populations (Evans et al., 1994; Frank et al., 2003; Link & Phelan, 1995).

The differential impact of alcohol varies according to social strata, and this is taken into consideration in the policy recommendations outlined in Chapter 8.

3) Average consumption, patterns of drinking and health consequences[8]

Identifying disease and injury conditions related to alcohol

The disease conditions related to alcohol can be grouped into three categories. These categories reflect the nature of the conditions and the etiologic influence of alcohol on those conditions:

1. Wholly alcohol-attributable conditions by definition, that is, with alcohol-attributable fractions (AAFs) of 100%
2. Chronic conditions where alcohol is a contributory cause, i.e. with AAFs lower than 100%
3. Acute conditions where alcohol is a contributory cause

The selected conditions wholly or partly attributable to alcohol except for acute conditions are based on the following set of comprehensive meta-analyses which assess the average volume of consumption and outcome: English et al., 1995; Single et al., 1996, 1999; Sjögren et al., 2000; Gutjahr et al., 2001; Ridolfo & Stevenson, 2001; Rehm et al., 2004. These meta-analyses were not independent; they all share a debt to the original work of English et al. (1995). Other meta-analyses were also included in this review, such as the work of Corrao and colleagues (Bagnardi et al., 2001; Corrao et al., 1999; 2000) and Longnecker (e.g. 1994; Longnecker et al., 1990).

Wholly alcohol-attributable consequences:

The conditions shown in Table 3.1 are, by definition, wholly attributable to alcohol (AAF=1 or 100%). For these conditions, no statistical procedures are necessary to estimate risk relationships. This does not mean that the underlying data lack measurement error, i.e. that all

[8] This chapter is an updated version of Rehm et al., 2003a

diagnoses of “alcoholic cirrhosis of liver” are in fact caused by alcohol. However, measurement error may also work in the opposite direction, where alcoholic liver cirrhosis are not identified as such and erroneously classified as other forms of liver cirrhosis.

Table 3.1: Disease conditions which are by definition alcohol-attributable (AAF = 100% or 1)

E24.4	Alcohol induced pseudocushing syndrome
F10.0, F10.3 - F10.9	Alcoholic psychoses and other alcohol-attributable mental disorders
F10.1	Alcohol abuse
F10.2	Alcohol dependence syndrome
G31.2	Degeneration of nervous system due to alcohol
G62.1	Alcoholic polyneuropathy
G72.1	Alcoholic myopathy
I42.6	Alcohol cardiomyopathy
K29.2	Alcoholic gastritis
K70.0	Alcoholic fatty liver
K70.1	Alcoholic hepatitis
K70.3	Alcoholic cirrhosis of the liver
K70.4	Alcoholic hepatic failure
K70.9, K70.2	Alcoholic liver disease, other
K86.0	Chronic pancreatitis (alcohol induced)
O35.4	Maternal care of suspected damage to the foetus from alcohol
P04.3	Foetus and newborn affected by maternal use of alcohol
Q86.0	Fetal alcohol syndrome (dysmorphic)
R78.0	Finding of alcohol in blood
T51	Toxic effect of alcohol
X45, X45.0 - X45.9	Accidental poisoning and exposure to alcohol
Y15	Poisoning by exposure to alcohol, undetermined intent
X65	Intentional self-poisoning by and exposure to alcohol
Z72.1	Problems related to lifestyle alcohol use

In order to distinguish alcoholic cirrhosis from cirrhosis from other types of cirrhosis, one can either take all conditions diagnosed as caused by alcohol (ICD 9: 571.0-571.3) with an AAF of 1.0, or one can estimate the alcohol-attributable proportion of all cirrhosis cases as a function of prevalence of alcohol exposure and relative risk (including both alcoholic and non-specified). In one Canadian study (Single et al., 1996; 1999), both of these methods produced virtually identical results. However, results of each method in estimating alcohol’s contribution to liver

cirrhosis may differ in other parts of the world. For instance, in many parts of the world, in other countries there is substantial under-recording of the alcohol component in cirrhosis (Puffer & Griffiths, 1967) and thus of alcoholic liver cirrhoses as diagnosis. In the present analyses, the latter method was adopted --i.e. the alcohol-attributable proportion of all cirrhosis cases was calculated as a function of prevalence of alcohol exposure and relative risk (including both alcoholic and non-specified cirrhosis) -- in order to avoid this type of error.

Chronic conditions where alcohol is a contributory cause

Table 3.2 gives an overview of chronic conditions that are not wholly attributable to alcohol, but where at least one meta-analysis has found a significant relationship to alcohol. Light yellow shaded rows indicate conditions for which the recent literature has been consistent in concluding sufficient evidence for a causal relationship. Sufficient evidence of causality is defined as: (1) evidence of an association (positive or negative) between alcohol consumption and the disease or injury; (2) chance, confounding variables and other biases which can be ruled out with reasonable confidence as factors in this association; and (3) evidence of a plausible biological mechanism or other mediating process (English et al., 1995).

This definition was made using the usual criteria for establishing causality in epidemiology (Hill, 1965; see Rothman & Greenland, 1998), with the most weight placed on the following four criteria:

- Consistency across several studies
- Established experimental biological evidence of mediating processes or at least physiological plausibility (biological mechanisms)
- Strength of the association (effect size)
- Temporality (i.e. cause before effect).

Two examples of judgements regarding somewhat controversial outcomes may illustrate this process of selecting relevant diseases. With lung cancer, after taking into account the damage on health from smoking, one meta-analysis showed a consistent impact from alcohol with a relatively large effect size (English et al., 1995). However, since evidence for the possible biological mechanism was inconclusive and residual confounding from smoking could not be excluded, English et al. (1995) decided to leave out lung cancer from the list of diseases influenced by alcohol. A more recent meta-analyses showed only borderline significant effects (Bagnardi et al., 2001) and the most recent review again concluded that the evidence for a causal relation was not sufficient (Bandera et al., 2001). Thus, at this time evidence that alcohol causes lung cancer is insufficient (according to the criteria listed above), and on this basis, lung cancer was excluded from the list of alcohol-attributable disease outcomes.

On the other hand, although English et al. (1995) concluded there was insufficient evidence linking alcohol consumption and breast cancer, recent advances both in biological and epidemiological research (Ellison et al., 2001; Smith-Warner et al., 1998) indicated the contrary. Breast cancer was included in the present analysis as an alcohol-attributable health effect.

Table 3.2: Chronic alcohol-attributable health effects identified by various meta-analyses

Disease	ICD-9	Reference to meta-analysis	Effect
Lip & oropharyngeal cancer	140, 141, 143-146, 148, 149, 230.0	En95; Si96, Si99; Sj00; Gu01; Ri01; R *Enough data to calculate relative risk for subcategories of disease, e.g. Corrao et al., 1999; Bagnardi et al., 2001*	detrimental
Oesophageal cancer	150, 230.1	En95; Si96, Si99; Sj00; Gu01; Ri01; Re04	detrimental
Stomach cancer	151	Bagnardi et al., 2001 *English et al. (1995) concluded inadequate evidence that alcohol causes stomach cancer because of the inconsistency of the research evidence.*	detrimental
Colon cancer	153	Bagnardi et al., 2001 *English et al. (1995), consistent with Longnecker et al., (1990) and IARC (1988), concluded inadequate evidence that alcohol causes colorectal cancer.*	detrimental

		However, IARC is currently reconsidering this classification	
Rectal cancer	154	Bagnardi et al., 2001 *English et al. (1995), consistent with Longnecker et al., (1990) and IARC (1988,) concluded inadequate evidence that alcohol causes colorectal cancer.*	detrimental
Liver cancer	155, 230.8	En95; Si96, Si99; Sj00; Gu01; Ri01; Re04	detrimental
Laryngeal cancer	161, 231.0	En95; Si96, Si99; Sj00; Gu01; Ri01; Re04	detrimental
Lung cancer	162	*Was excluded from the list of outcomes causally related to alcohol by English et al. (1995). This decision has not been revised by any further meta-analyses. The most recent meta-analysis on alcohol and lung cancer found only a borderline significant result (Bagnardi et al. 2001) and the last substantive review found no sufficient support for a causal relation (Bandera et al., 2001).*	detrimental
Female breast cancer	174, 233.0	Si96, Si99; Sj00; Gu01; Ri01; Re04 *English et al. (1995) concluded there was only limited evidence for causality, although they found a consistent relationship. Subsequent studies using the same criteria concluded that there was sufficient evidence of a relationship.*	detrimental
Ovarian cancer	183	Bagnardi et al., 2001 *English et al. (1995), consistent with IARC (1988) concluded inadequate evidence that alcohol causes ovarian cancer.*	detrimental
Prostate cancer	185	Bagnardi et al., 2001 *Causality of relationship is not yet clear.*	detrimental
Diabetes	250	Si96, Si99; Gu01; Re04 *English et al (1995) found only inadequate evidence of causality. Subsequent studies using the same criteria for causality as English et al. (1995; for details on criteria see text) revised this decision (see also Ashley et al., 2000).*	mainly beneficial
Unipolar major depression	300.4	Re04 *Meta-analyses are not possible based on available data for estimating relative risk or AAFs.*	detrimental
Epilepsy	345	En95; Si96, Si99; Sj00; Gu01; Ri01; Re04	detrimental
Hypertension	401-405	En95; Si96, Si99; Sj00; Gu01; Ri01; Re04	detrimental, seems to depend on patterns of drinking for low volume
Coronary (Ischaemic) Heart Disease	410-414	En95; Si96, Si99; Sj00; Gu01; Ri01; Re04 *Most recent meta-analysis of Corrao et al. (2000) found heterogeneity among studies. Pattern of drinking must be included in analysis (Re04; Puddey et al., 1999; McKee & Britton, 1998).*	beneficial or detrimental, depending on patterns of drinking
Cardiac arrhythmias	427.0, 427.2, 427.3	En95; Si96, Si99; Sj00; Gu01; Ri01; Re04	Detrimental
Heart failure	428-429	En95; Si96, Si99; Gu01; Ri01; Re04 *This is an unspecific category with no identification of underlying pathology. Therefore, the relationship between average volume of consumption and outcome was usually not determined by meta-analyses, but indirectly from other circulatory diseases.*	
Stroke	430-438	En95; Si96, Si99; Sj00; Gu01; Ri01; Re04 *Meta-analyses should be separated by type of stroke: haemorrhagic vs. ischaemic stroke as done by Ridolfo & Stevenson, 2001 and Re04*	beneficial or detrimental, depending on type of stroke and

			average volume of consumption
Oesophageal varices	456.0-456.2	En95; Si96, Si99; Sj00; Gu01; Ri01; Re04 *Not based on meta-analyses. As most oesophageal varices are due to liver cirrhosis, the AF derived for unspecific liver cirrhosis are applied*	Detrimental
Gastro-oesophageal haemorrhage	530.7	En95; Si96, Si99; Sj00; Gu01; Ri01; Re04 *Not based on meta-analyses but clinically documented.*	Detrimental
Liver cirrhosis	571.0-571.9	En95; Si96, Si99; Sj00; Gu01; Ri01; Re04 *English et al. (1995) and the other meta-analyses included studies on all kinds of liver cirrhosis, included the ones defined as caused by alcohol by definition (see above).*	Detrimental
Cholelithiasis	574	En95; Si96, Si99; Sj00; Gu01; Ri01; Re04	Beneficial
Acute pancreatitis	577.0	En95; Si96, Si99; Sj00; Gu01; Ri01; Re04 *Originally determined by clinical case studies.*	Detrimental
Chronic pancreatitis	577.1	En95; Si96, Si99; Sj00; Gu01; Ri01; Re04 *Usually determined by clinical case studies (but see Corrao et al., 1999).*	Detrimental
Spontaneous abortion	634	En95; Si96, Si99; Gu01; Ri01; Re04 *To be applied to the fraction of females with alcohol consumption during pregnancy.*	Detrimental
Low birth weight	656.5	En95; Si96, Si99; Gu01; Ri01; Re04 *To be applied to the fraction of females with alcohol consumption during pregnancy.*	Detrimental
Psoriasis	696.1	En95; Si96, Si99; Gu01; Ri01; Re04	Detrimental
Prematurity	764	Si96, Si99; Gu01; Re04 *English et al. (1995) concluded for all birth defects combined (ICD 9 740-759) that there is inadequate evidence for a causation of alcohol during pregnancy. Other authors, based on the same criteria for causality as English et al. (1995) concluded sufficient evidence for a causal effect..*	Detrimental
Intrauterine growth-retardation	765	Si96, Si99; Gu01; Re04 *English et al. (1995) concluded for all birth defects combined (ICD 9 740-759) that there is inadequate evidence for a causation of alcohol during pregnancy. Other authors, based on the same criteria for causality as English et al. (1995) concluded sufficient evidence for a causal effect.*	Detrimental

En95: English et al., 1995; Si96: Single et al., 1996; Si99: Single et al., 1999; Sj00: Sjögren et al., 2000; Gu01: Gutjahr, Gmel, Rehm, 2001; Ri01: Ridolfo & Stevenson, 2001; Re04: Rehm et al., 2004

Light yellow shaded rows indicate conditions for which the recent literature has been consistent in concluding sufficient evidence for a causal relationship.

Acute adverse health consequences -- Accidental injury and poisoning, suicide, interpersonal violence and assaults

Alcohol use has been associated with increased risk of injury and death in a wide variety of settings, including vehicular crashes, bicycling accidents, incidents involving pedestrians, falls,

fires, injuries related to sports and recreational activities, self-inflicted injuries and injuries resulting from interpersonal violence (Cherpitel, 1992; Hingson & Howland, 1987, 1993; United States Department of Health and Human Services 1997, 2000; Martin, 1992; Martin & Bachman, 1997; Murdoch et al., 1990; Freedland et al., 1993; Hurst et al., 1994). There is also some evidence that the presence of alcohol in the body at the time of injury may be associated with greater severity of injury and less positive outcomes (Cherpitel, 1996b).

Unintentional injuries: This section will highlight research findings establishing a causal link between alcohol use and unintentional injury. We will also evaluate the dose-response relationships and the effect of drinking patterns. The discussion will focus primarily on traffic injuries, first because traffic accidents account for a large part of unintentional injuries related to alcohol and constitute the most lethal common category of unintentional injury, and second, because most of the research has been conducted in this area (see also Rehm et al., 2004).

Studies relating average volume of drinking to risk of injury have found that risk of injury is positively related to average consumption of alcohol, and that increased risk starts at relatively low volumes of intake (e.g., Cherpitel et al., 1995). Several specific patterns of drinking have been related to injury risk. In particular, frequency of heavy drinking and perceived intoxication are both associated with injury in general (Cherpitel, 1996a) as well as with death due to injury (Li et al., 1994). In studies of the relationship between drinking pattern and risk of injury from drunk driving (Gruenewald & Nephew, 1994; Gruenewald et al., 1996a,b; Treno & Holder, 1997; Treno et al., 1997), the highest risk was found for individuals who consume relatively large amounts on some occasions, and whose highest amounts are markedly greater than their average amount per occasion, after adjusting for other drinking pattern variables and characteristics of the drinker. This finding suggests that those who do not usually drink heavily may be most at risk of injury when they do drink heavily.

A long series of retrospective studies have involved comparison of blood alcohol content (BAC) levels in individuals who have experienced a collision or trauma with selected individuals not involved in trauma, using a case-control design (Cherpitel, 1992; Freedland et al., 1993; Fuller, 1995; Stoduto et al., 1993; United States Department of Health and Human Services, 1997; Hurst et al., 1994). These studies found that there is an increased risk of sustaining a collision the higher the BAC level. One of the most influential case-control series was the Grand Rapids study of 5,985 collisions and 7,590 controls (Borkenstein et al., 1964). Re-analysis of this study using current sophisticated statistical techniques found that all levels of BAC were associated with an increased risk of crashes relative to a BAC of zero, and that the risk curve was an accelerating slope in which the risk of crashes involving injury increased markedly with high BACs (Hurst et al., 1994).

There are obvious reasons why alcohol is related to injury. Controlled experimental studies have demonstrated that even moderate doses of alcohol have cognitive and psychomotor effects such as increased reaction time, impaired cognitive processing, and reduced co-ordination and vigilance that are relevant to the risk of injury (Moskowitz and Robinson, 1988; United States Department of Health and Human Services, 1997; Krüger et al., 1993; Eckardt et al., 1998). A recent comprehensive review by Eckardt and colleagues (Eckardt et al., 1998 p. 1015) concluded that the threshold dose for negative effects on psychomotor tasks is generally found at around 40 to 50 mg% (equivalent to BACs of .04-.05%). This review also noted that injury could occur as a result of alcohol's disruption of psychomotor function in individuals at BACs at this level.

Overall, causality for traffic accidents can be established for the following reasons:

1) Alcohol is clearly associated with the outcome.
2) There is a dose-response relationship: the higher the BAC, the higher the risk of crashes involving injury.
3) There is a biological explanation for the relationship based on the mediating effects of alcohol on cognitive and psychomotor performance.
4) Where suitable interventions have been implemented to reduce alcohol in the situation, the outcome is reduced as well. Thus, Shults et al. (2001) in a meta-analysis found random breath testing programs and selective breath testing checkpoints to be effective in reducing the mortality of traffic accidents by 20% and 18%, respectively.

The fact that alcohol is related causally to traffic accidents does not imply that the attributable fractions are constant across conditions or regions. Clearly, AAFs for unintentional injuries vary by place and time, not only because of drinking patterns but also because of other interacting factors, such as conditions of roads and vehicles, seatbelt usage, availability of public transport, etc. Thus, the AAFs for injuries have wider confidence intervals than the risk relationships between alcohol and chronic diseases above (see below and Rehm et al., in press).

Intentional injuries: Alcohol is consistently associated with violent injury (Graham & West, 2001), although this association varies considerably across countries (Murdoch, Pihl & Ross, 1990; Room & Rossow, 2001). Experimental research suggests that alcohol plays a causal contributing role in aggression, and meta-analyses of experimental studies suggest a small to moderate effect size in the overall relationship between alcohol consumption and aggression (Bushman, 1997). Some effort has been made to attempt to separate pharmacological effects from expectations, but the general conclusion is that expectations form part of the “psycho-pharmacological” effects of alcohol (Bushman, 1997; Graham et al., 1998), and neither can nor should be separated in attempting to understand the effects of alcohol as consumed by human beings.

General conclusions on acute consequences: Acute consequences like injuries and accidents are clearly linked to average volume of alcohol consumption and to patterns of drinking, especially heavy drinking occasions with intoxication. Thus, in modelling the risk relationships, both dimensions have to be incorporated. In the CRA, this was achieved again by a multi-level analysis similar to the analyses done for alcohol and CHD described above (see Rehm et al., 2004, for details). The results confirmed the hypotheses that alcohol has detrimental effects on injuries, with patterns of heavy drinking occasions potentiating the relationship between violence and average volume of alcohol consumption.

4) Alcohol-attributable mortality and morbidity in Canada 2002

In the following section, based on the knowledge laid out above, estimates of alcohol-attributable mortality, years of life lost and morbidity in Canada 2002 will be given. The chapter starts with laying out the methodology, and then results are presented, before potential shortcomings are discussed.

Methodology underlying the tables in this chapter

Sources for exposure

To measure alcohol consumption, we followed English et al. (1995) and used four drinking categories based on average volume of alcohol consumed (see Rehm et al., in press, for an overview). The prevalence data of different levels of current alcohol consumption were collected between 2003 and 2004 through the CAS (Canadian Centre on Substance Abuse, 2004). This survey was selected because it contains fairly detailed alcohol consumption exposure data for a time period closest to the mortality data. Alcohol consumption has been relatively stable in Canada over the past years thus a difference of two to three years between mortality and exposure data is negligible.

Determining attributable fractions

The alcohol-attributable fraction (AF) is defined as the fraction of the disease in the population that would not have occurred if the effect associated with the alcohol was absent (Walter, 1976; 1980). AFs were assessed for different specific causes of illnesses (for details see Rehm et al., in press; Taylor et al., submitted):

- For disease conditions which require the presence of alcohol, an AF of 100% was attributed (e.g., alcohol dependence; see list in Table 3.1 above).
- Chronic disease alcohol-attributable fractions were calculated by combining exposure data and relative risk estimates from meta-analyses.

- Injury alcohol-attributable fractions were calculated using direct estimates of alcohol involvement from various statistics, i.e. police statistics on alcohol involvement in traffic accidents (see Rehm et al., in press).

We used the most comprehensive meta-analysis for each condition, as indicated in Appendix 1. The relative risk for each condition was combined with different levels of exposure for each gender and age group and an attributable fraction was obtained using the following formula (see Walter, 1976, 1980).

$$AF = [\sum_{i=1}^{k} P_i(RR_i - 1)]/[\sum_{i=0}^{k} P_i(RR_i - 1) + 1]$$

i: exposure category with baseline exposure or no exposure i=0
RR(i): relative risk at exposure level i compared to no consumption
P(i): prevalence of the i*th* category of exposure

The AFs were then applied to mortality, years of life lost and morbidity data.

Sources of mortality data

Mortality data in Canada for the year 2002, with the underlying cause coded according to the International Classification of Diseases version 10 (ICD 10), were obtained from Statistics Canada.

Determining potential years of life lost

Potential years of life lost (PYLL) is an indicator of premature mortality; that is, individuals would have lived longer if they had not consumed alcohol. The average extra time such individuals would have lived is known as the residual life expectancy. For example, if a male died of alcoholic liver cirrhoses at age 50, in Canada, he would have a residual life expectancy of 28.4 years (WHO Statistical Information System, 2000). The sum of these extra times for all people dying from alcohol consumption is known as PYLL due to alcohol. PYLL for each sex-age

group category is estimated from the observed mean age at death in the age interval and the standard life expectancies tables at the exact ages defining the age interval through interpolation. The standard life expectancies table for rates of mortality in Canada in 2000 is available from the World Health Organization (WHO) website (http://www.who.int/evidence). Following the rules specified by the Global Burden of Diseases study (Mathers et al., 2001), the mean ages within intervals have been calculated. PYLL from death in Canada has been calculated for each age group (0-14, 15-29, 30-44, 45-59, 60-69, 70-79, and 80+) by multiplying the number of deaths by the interpolated life expectancy for the observed mean age at death in the interval. The mean age for 80+ age group for men (84 years) and women (85 years) were calculated from the life expectancy table. The upper age limits of 76.0 years for men and 81.5 years for women were used to approximate the life expectancy of Canadians by gender at birth.

Sources of hospitalization data

For the fiscal year 2002-2003, we obtained hospital diagnoses, separations, and length of stay data for acute care hospitals in Canada. These were obtained from the Canadian Institute for Health Information (CIHI) on a national level as well as provincial level according to the International Classification of Diseases version 10 (ICD-10). National level data were provided for each disease condition as well as for each sex and by age group in 5-year intervals,from 0 to 80+, whereas provincial data were provided on an aggregated basis i.e., no sex or age breakdown.[9]

National level data comprise only 7 provinces and 2 territories (Alberta, British Columbia, Newfoundland and Labrador, Northwest Territories, Nova Scotia, Ontario, Prince Edward Island,

[9] This was a result of insufficient cell data (suppressed cells) and low numbers of counts as a result of stratifying into groups of ICD code, age, and sex. Estimating them would either inflate or deflate the real numbers. The CIHI suppresses cells with raw numbers below 5 for confidentiality reasons.

Saskatchewan, Yukon). Based on this information, data for entire country was estimated using the total population (for further information see Rehm et al., in press).

Hospital days[10] were categorized following the Most Responsible Diagnosis (MRD) on the patient's hospital record. MRD describes the most significant or primary condition of the patient considered responsible for his/her stay in hospital.[11] However, as the hospital days based on the MRD may overlap in cases with more than one MRD, thus calculated hospital days had to be adjusted to the overall hospital days in Canada. This adjustment implied a province-specific application of a shrinkage factor, derived by dividing the number of hospital days in a province by the number of MRD hospital days in the same province.

Summary tables on alcohol-attributable mortality and morbidity in Canada, 2002

Table 4.1 provides the estimates of alcohol-attributable deaths, and deaths prevented by alcohol consumption. In 2002, 8,103 alcohol-attributable deaths were estimated overall in Canada (2,360 women and 5,744 among men). Further, it is estimated that approximately 3,845 deaths were prevented due to moderate alcohol consumption (1,595 women and 2,250 men).

Among deaths caused by alcohol, cirrhosis of the liver (1,246 deaths, men 882; women 364), motor vehicle accidents (909 deaths, men 746; women 163), suicides/self-inflicted injuries (603 deaths, men 493; women 109), oesophageal cancer (501 deaths, men 407; women 95), and cardiac arrhythmias (449 deaths, men 243; women 205) constituted the largest alcohol-

[10] In this context hospital days refers to the length of stay associated with a stay in an acute care hospital.
[11] In a case where multiple diagnoses may be classified as most responsible, coders were instructed to code the diagnosis responsible for the longest length of stay (CIHI, 2004).

attributable categories. Most of the estimated deaths prevented by alcohol were from ischaemic heart disease (2,951 deaths) and almost 80% of these prevented deaths after age 70.

In 2002, 191,136 life years were lost in Canada due to alcohol, accounting for 50,360 years among women and 140,776 years among men (Table 4.2). Similarly, 43,565 life years were prevented in Canada due to alcohol accounting for 16,169 years among women and 27,396 years among men (Table 4.3).

Table 4.1: Alcohol-attributable fractions, mean age at death, and number of deaths associated with alcohol by sex, age and disease category in Canada, 2002

	AAF%		Mean age		Number of deaths																
CONDITION	(all ages)		at death		0-14 yrs		15-29 yrs		30-44 yrs		45-59 yrs		60-69 yrs		70-79 yrs		80+ yrs		TOTAL		OVERALL
DETRIMENTAL EFFECTS	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
MALIGNANT NEOPLASMS																					
Oropharyngeal cancer	32.7	18.6	65.0	69.7	--	--	1	1	11	2	68	11	75	14	61	17	31	17	**247**	**61**	**308**
Oesophageal cancer	37.6	24.1	67.8	74.0	--	--	1	0	11	2	91	9	105	17	134	35	66	31	**407**	**95**	**501**
Liver cancer	31.7	22.0	67.5	72.3	--	--	1	1	9	2	65	15	70	22	97	42	43	35	**285**	**117**	**402**
Laryngeal cancer	42.5	31.0	69.8	69.6	--	--	0	0	1	0	31	5	46	8	62	8	32	6	**172**	**27**	**199**
Breast cancer	--	6.4	--	67.3	--	--	--	1	--	23	--	81	--	61	--	72	--	80	--	**318**	**318**
Other neoplasms	8.7	5.0	71.2	76.5	--	--	2	0	3	1	7	3	11	3	19	11	20	19	**62**	**38**	**100**
TOTAL	**30.5**	**9.3**	**67.6**	**70.0**	--	--	**4**	**3**	**35**	**30**	**261**	**124**	**308**	**126**	**372**	**184**	**192**	**189**	**1,172**	**657**	**1,828**
NEURO-PSYCHIATRIC CONDITIONS																					
Alcholic psychoses	100.0	100.0	62.1	67.9	--	--	3	0	23	3	41	12	33	8	35	15	24	11	**159**	**49**	**208**
Alcohol dependence syndrome	100.0	100.0	62.1	61.0	--	--	2	0	26	6	92	32	78	21	82	11	18	8	**298**	**78**	**376**
Alcohol abuse	100.0	100.0	60.5	58.3	--	--	0	0	15	9	36	14	24	6	21	8	10	4	**106**	**41**	**147**
Unipolar major depression	8.4	2.8	78.6	82.8	--	--	0	0	0	0	0	0	0	0	1	0	2	2	**3**	**2**	**6**
Degeneration of nervous system due to alcohol	100.0	100.0	69.0	75.3	--	--	0	0	0	0	3	1	4	0	6	0	2	2	**15**	**3**	**18**
Epilepsy	49.7	37.5	49.3	65.0	--	--	11	3	22	7	16	10	6	5	8	7	7	18	**69**	**50**	**119**
Alcoholic polyneuropathy	100.0	100.0	87.0		--	--	0	0	0	0	0	0	0	0	0	0	1	0	**1**	**0**	**1**
TOTAL	**85.9**	**57.8**	**60.7**	**63.3**	--	--	**16**	**3**	**86**	**25**	**188**	**69**	**145**	**40**	**152**	**42**	**64**	**44**	**651**	**223**	**875**
CARDIO VASCULAR DISEASES																					
Hypertensive disease	22.6	7.8	75.2	82.8	--	--	0	0	4	0	20	2	23	5	41	16	79	70	**168**	**93**	**261**
Alcoholic cardiomyopathy	100.0	100.0	60.0	63.5	0	0	0	0	5	1	22	3	8	4	12	3	3	1	**50**	**12**	**62**
Cardiac arrhythmias	25.7	17.3	74.5	82.5	--	--	3	1	10	2	26	6	27	7	67	32	110	157	**243**	**205**	**449**
Cerebrovascular disease (males)	2.6		75.0	--	--	--	1	--	5	--	16	--	23	--	51	--	73	--	**169**	--	**169**
Haemorrhagic stroke	*8.9*		*78.8*	--	--	--	*0*		*3*		*16*		*35*		*108*		*185*		**347**		***347***
Oesophageal varices	53.9	44.5	65.6	74.9	--	--	0	0	0	0	3	1	3	1	2	0	1	3	**10**	**5**	**15**
TOTAL	**7.9**	**2.8**	**73.6**	**81.7**	**0**	**0**	**4**	**1**	**24**	**3**	**88**	**12**	**84**	**18**	**174**	**52**	**266**	**231**	**640**	**316**	**956**
DIGESTIVE DISEASES																					
Alcoholic gastritis	100.0	100.0	63.7	64.5	--	--	0	0	0	0	1	0	1	1	1	0	0	0	**3**	**1**	**4**
Cirrhosis of the liver	58.1	45.7	61.9	65.0	--	--	2	1	62	32	305	93	259	84	192	96	62	58	**882**	**364**	**1,246**
Acute and chronic pancreatitis	23.2	11.7	64.9	74.9	--	--	1	0	3	1	9	2	10	3	10	4	7	8	**40**	**18**	**57**
Chronic pancreatitis (alcohol induced)	100.0	100.0	63.0	59.5	--	--	0	0	3	0	5	2	2	0	5	1	3	0	**18**	**3**	**21**
TOTAL	**55.1**	**40.6**	**62.1**	**65.4**	--	--	**3**	**1**	**68**	**32**	**320**	**97**	**271**	**88**	**208**	**101**	**72**	**66**	**943**	**386**	**1,328**
SKIN DISEASES																					
TOTAL (Psoriasis)	27.5	15.4	56.0	74.5	--	--	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**

Table 4.1 : Continued

CONDITION	AAF% (all ages)		Mean age at death		Number of deaths																
					0-14 yrs		15-29 yrs		30-44 yrs		45-59 yrs		60-69 yrs		70-79 yrs		80+ yrs		TOTAL		OVERALL
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
CONDITIONS ARISING DURING THE PERINATAL PERIOD (maternal use)																					
Low birth weight & short gestation	6.8	6.8	0.0	0.0	10	7	–	–	–	–	–	–	–	–	–	–	–	–	**10**	**7**	**17**
Foetal alcohol syndrome	100.0	100.0	0.0	0.0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**1**	**1**
TOTAL	**1.0**	**1.0**	**0.0**	**0.0**	**10**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**8**	**18**
UNINTENTIONAL INJURIES																					
Motor vehicle accidents	39.4	18.2	34.6	41.8	19	9	329	45	230	40	105	38	21	9	21	12	19	10	**746**	**163**	**909**
Poisonings	24.0	21.5	39.4	41.3	0	0	40	16	70	25	49	22	4	4	2	1	1	1	**167**	**69**	**236**
Accidental poisoning & exposure to alcohol	*100.0*	*100.0*	*44.6*	*46.2*	*0*	*0*	*3*	*2*	*25*	*7*	*16*	*5*	*4*	*3*	*2*	*1*	*0*	*0*	***50***	***18***	***68***
Falls	17.9	5.9	63.4	69.8	0	0	12	1	19	5	43	10	19	5	22	5	51	23	**165**	**50**	**215**
Fires	40.8	18.5	39.3	41.1	5	3	11	2	20	3	13	3	3	1	3	2	1	1	**56**	**15**	**71**
Drownings	33.8	28.7	43.1	45.9	0	0	23	4	21	6	29	5	5	1	4	1	3	2	**84**	**19**	**103**
Other unintentional injuries	30.6	20.4	56.7	76.7	13	3	65	8	96	13	89	24	40	12	60	37	129	194	**492**	**292**	**783**
TOTAL	**30.8**	**16.6**	**44.8**	**60.9**	**37**	**14**	**480**	**77**	**457**	**92**	**328**	**102**	**92**	**32**	**113**	**58**	**204**	**233**	**1,710**	**608**	**2,318**
INTENTIONAL INJURIES																					
Suicide, self-inflicted injuries	17.3	13.7	39.9	41.7	0	0	131	24	183	37	141	40	26	6	8	1	4	1	**493**	**109**	**603**
Intentional self-poisoning by and exposure to alcohol	*100.0*	*100.0*	*48.5*	*50.8*	*0*	*0*	*0*	*0*	*2*	*2*	*2*	*0*	*1*	*2*	*0*	*0*	*0*	*0*	***5***	***4***	***9***
Homicide	36.7	34.0	35.7	37.0	3	4	45	17	34	13	25	9	5	2	3	3	1	2	**116**	**50**	**165**
Other Intentional injuries	29.7		28.4		0	0	1	0	0	0	0	0	0	0	0	0	0	0	**2**	**0**	**2**
TOTAL	**19.2**	**16.7**	**39.0**	**40.2**	**3**	**4**	**178**	**41**	**217**	**50**	**166**	**49**	**31**	**8**	**11**	**4**	**5**	**3**	**611**	**159**	**770**
Ethanol and methanol toxicity, undetermined intent	100.0	100.0	40.0	54.5	0	0	0	0	4	1	1	1	0	0	0	1	0	0	**5**	**3**	**8**
Finding of alcohol in blood	100.0	100.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**0**
TOTAL DETRIMENTAL EFFECTS			**56.7**	**65.7**	**50**	**26**	**684**	**126**	**892**	**234**	**1,353**	**453**	**931**	**311**	**1,030**	**442**	**803**	**767**	**5,744**	**2,360**	**8,103**
BENEFICIAL EFFECTS																					
Diabetes mellitus	-5.1	-2.5	71.7	78.0	–	–	-1	0	-7	-1	-27	-6	-38	-10	-62	-27	-58	-52	-191	-96	-288
Ishaemic heart disease (CVD)	-9.3	-4.9	73.5	80.7	–	–	-2	0	-44	-6	-281	-37	-352	-67	-611	-206	-762	-584	-2,051	-900	-2,951
Cerebrovascular disease (females)		-6.6		81.0	–	–	–	-1	–	-8	–	-23	–	-34	–	-121	–	-407		-594	-594
Ischaemic stroke	*-0.6*	*-8.2*	*73.7*	*71.6*	–	–	*0*	*-1*	*0*	*-9*	*-1*	*-21*	*-1*	*-18*	*-3*	*-39*	*-3*	*-50*	*-9*	*-137*	*-146*
Haemorrhagic stroke		*-3.6*		*82.8*	–	–		*0*		*-1*		*-4*		*-9*		*-42*		*-159*		*-214*	*-214*
Cholethiasis	-13.1	-7.1	77.1	81.8	–	–	0	0	0	0	-1	0	-1	0	-2	-1	-4	-4	-7	-6	-13
TOTAL BENEFICIAL EFFECTS			**73.4**	**80.6**	–	–	**-2**	**-1**	**-50**	**-16**	**-308**	**-67**	**-390**	**-111**	**-675**	**-354**	**-824**	**-1,046**	**-2,250**	**-1,596**	**-3,845**
TOTAL NET EFFECTS			**46.4**	**56.6**	**50**	**26**	**682**	**124**	**842**	**218**	**1,045**	**386**	**541**	**200**	**355**	**88**	**-21**	**-280**	**3,494**	**764**	**4,258**

Categories in italic are sub-categories of immediate prior category

Table 4.2: Potential years of life lost due to alcohol in Canada by sex and age, 2002

	M	F	TOTAL
CANADA			
0-14 yrs	3,413	1,933	5,345
15-29 yrs	37,202	7,488	44,689
30-44 yrs	35,674	10,516	46,189
45-59 yrs	35,380	13,888	49,268
60-69 yrs	14,857	6,151	21,008
70-79 yrs	9,834	5,402	15,236
80+ yrs	4,417	4,982	9,399
TOTAL	**140,776**	**50,360**	**191,136**

Table 4.3: Potential years of life saved due to alcohol in Canada by sex and age, 2002

	M	F	TOTAL
CANADA			
0-14 yrs	0	0	0
15-29 yrs	-130	-72	-202
30-44 yrs	-2,009	-729	-2,738
45-59 yrs	-8,055	-2,049	-10,104
60-69 yrs	-6,227	-2,197	-8,424
70-79 yrs	-6,443	-4,322	-10,765
80+ yrs	-4,531	-6,802	-11,332
TOTAL	**-27,396**	**-16,169**	**-43,565**

Table 4.4: Alcohol-attributable fractions, mean age at hospital diagnosis, and number of hospital diagnoses due to morbidity associated with alcohol by sex, age and disease category in Canada, 2002

	AAF%		Mean age		Number of hospital diagnoses																
CONDITION	(all ages)		at diagnosis		0-14 yrs		15-29 yrs		30-44 yrs		45-59 yrs		60-69 yrs		70-79 yrs		80+ yrs		TOTAL		OVERALL
DETRIMENTAL EFFECTS	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
MALIGNANT NEOPLASMS																					
Mouth and oropharynx cancers	33.5	19.4	59.7	61.0	0	0	19	15	121	48	437	125	304	85	220	79	80	57	**1,182**	**409**	**1,591**
Oesophageal cancers	37.9	24.6	66.5	70.0	0	0	3	0	30	7	259	40	286	61	314	71	140	58	**1,032**	**237**	**1,270**
Liver cancer	31.0	21.5	63.9	68.9	0	0	8	3	39	12	248	48	214	61	242	90	72	62	**824**	**277**	**1,101**
Laryngeal cancer	43.2	31.2	65.7	65.4	0	0	2	1	21	5	134	28	210	31	164	35	62	12	**593**	**113**	**706**
Breast cancer	--	6.5	0.0	60.7	--	0	--	9	--	195	--	564	--	336	--	298	--	169	**--**	**1,571**	**1,571**
Other neoplasms	9.1	5.5	66.2	55.0	0	0	1	9	4	62	9	99	16	49	17	38	8	16	**55**	**273**	**328**
TOTAL	**33.8**	**8.5**	**63.6**	**61.9**	0	0	**34**	**38**	**216**	**329**	**1,088**	**904**	**1,030**	**623**	**957**	**612**	**363**	**374**	**3,687**	**2,879**	**6,566**
NEURO-PSYCHIATRIC CONDITIONS																					
Alcoholic psychoses	100.0	100.0	47.4	44.6	0	0	1,690	950	3,249	1,634	3,717	1,369	1,439	455	939	325	239	121	**11,273**	**4,854**	**16,127**
Alcohol dependence syndrome	100.0	100.0	52.7	49.4	0	0	1,088	689	4,524	2,448	6,554	2,438	3,249	1,037	2,230	711	645	254	**18,290**	**7,577**	**25,867**
Alcohol abuse	100.0	100.0	46.8	43.8	0	0	1,954	1,416	3,384	1,989	3,194	1,440	1,343	477	1,034	455	326	207	**11,235**	**5,985**	**17,219**
Unipolar major depression	11.0	2.3	47.9	54.5	0	0	713	179	1,000	281	892	288	344	127	371	188	259	198	**3,579**	**1,261**	**4,840**
Degeneration of nervous system due to alcohol	100.0	100.0	60.9	59.5	0	0	4	0	33	28	221	62	178	74	105	34	31	7	**571**	**204**	**775**
Epilepsy	39.1	29.3	48.4	51.7	0	0	770	531	1,157	682	1,155	703	516	376	463	410	230	323	**4,291**	**3,025**	**7,316**
Alcoholic polyneuropathy	100.0	100.0	58.7	55.9	0	0	4	0	11	7	26	11	22	7	19	0	4	4	**85**	**29**	**114**
TOTAL	**57.9**	**27.4**	**49.5**	**47.6**	0	0	**6,222**	**3,765**	**13,358**	**7,069**	**15,760**	**6,311**	**7,091**	**2,553**	**5,161**	**2,123**	**1,733**	**1,115**	**49,324**	**22,935**	**72,259**
CARDIO VASCULAR DISEASE																					
Hypertensive disease	23.8	8.1	66.8	71.8	0	0	295	76	1,805	491	8,480	2,129	9,453	2,752	11,201	4,591	6,253	4,641	**37,487**	**14,680**	**52,167**
Alcoholic cardiomyopathy	100.0	100.0	59.3	59.8	0	0	4	0	77	7	262	32	222	28	131	13	22	4	**717**	**84**	**801**
Cardiac arrhythmias	26.1	17.5	70.4	75.2	0	0	320	178	934	416	3,768	1,190	5,386	2,051	8,968	5,031	6,645	6,703	**26,021**	**15,569**	**41,589**
Cerebrovascular disease	3.0		67.8		0		24		76		281		352		481		307		**1,520**		**1,520**
Haemorrhagic stroke	*9.3*		*70.6*		0		*19*		*77*		*399*		*615*		*924*		*668*		***2,701***		***2,701***
Oesophageal varices	54.4	41.5	57.8	62.4	0	0	23	8	98	30	382	109	180	81	144	80	50	43	**878**	**351**	**1,229**
TOTAL	**5.8**	**3.5**	**68.0**	**73.4**	**0**	**0**	**666**	**262**	**2,990**	**944**	**13,173**	**3,460**	**15,592**	**4,913**	**20,924**	**9,714**	**13,276**	**11,392**	**66,622**	**30,684**	**97,306**
DIGESTIVE DISEASES																					
Alcoholic gastritis	100.0	100.0	48.9	46.5	0	0	136	65	485	195	523	207	213	68	128	32	31	4	**1,515**	**572**	**2,087**
Cirrhosis of the liver	58.9	45.0	57.5	59.6	0	0	93	51	1,108	493	3,702	1,163	2,067	841	1,334	687	314	272	**8,619**	**3,507**	**12,126**
Acute and chronic pancreatitis	24.9	12.1	52.5	55.0	0	0	239	150	688	274	939	377	416	194	340	205	169	161	**2,792**	**1,361**	**4,153**
Chronic pancreatitis (alcohol induced)	100.0	100.0	49.1	48.0	0	0	48	25	432	128	550	152	163	46	77	15	11	7	**1,282**	**374**	**1,656**
TOTAL	**22.5**	**4.6**	**54.8**	**56.5**	0	0	**516**	**291**	**2,713**	**1,090**	**5,714**	**1,899**	**2,859**	**1,149**	**1,880**	**940**	**525**	**444**	**14,208**	**5,813**	**20,021**
SKIN DISEASES																					
TOTAL (Psoriasis)	**26.3**	**16.5**	**58.2**	**58.7**	0	0	**17**	**21**	**70**	**39**	**142**	**57**	**98**	**44**	**74**	**52**	**41**	**33**	**442**	**248**	**690**

Table 4.4 : Continued

CONDITION	AAF% (all ages)		Mean age at diagnosis		Number of hospital diagnoses																
					0-14 yrs		15-29 yrs		30-44 yrs		45-59 yrs		60-69 yrs		70-79 yrs		80+ yrs		TOTAL		OVERALL
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
CONDITIONS ARISING DURING THE PERINATAL PERIOD																					
Low birth weight	6.8	6.8	0.0	0.0	1,862	1,668	--	--	--	--	--	--	--	--	--	--	--	--	**1,862**	**1,668**	**3,530**
Fetal alcohol syndrome	100.0	100.0	10.8	14.6	254	178	159	159	25	45	7	11	0	0	0	0	0	0	**445**	**394**	**838**
TOTAL	**100.0**	**100.0**	**2.5**	**3.2**	**2116**	**1846**	**159**	**159**	**25**	**45**	**7**	**11**	**0**	**0**	**0**	**0**	**0**	**0**	**2,307**	**2,062**	**4,368**
UNINTENTIONAL INJURIES																					
Motor vehicle accidents	26.1	12.3	34.0	40.7	138	64	1,390	277	1,050	297	469	232	101	64	94	71	56	51	**3,297**	**1,055**	**4,352**
Poisonings	8.3	7.3	40.3	44.1	0	0	134	103	94	67	85	86	28	31	17	21	11	19	**370**	**328**	**698**
Accidental poisoning and exposure to alcohol	*100.00*	*100.0*	*38.6*	*33.6*	*30*	*27*	*86*	*68*	*99*	*61*	*88*	*41*	*32*	*7*	*11*	*7*	*7*	*4*	***352***	***216***	***567***
Falls	8.5	3.9	52.3	58.4	0	0	692	190	805	324	1,065	1,055	408	278	416	250	555	524	**3,941**	**2,622**	**6,563**
Fires	18.4	9.2	35.9	34.2	19	11	60	6	46	7	32	9	11	2	11	2	4	2	**183**	**40**	**223**
Drownings	9.5	10.1	44.5	48.9	0	0	6	3	5	1	5	7	3	1	2	1	0	1	**21**	**15**	**36**
Other unintentional injuries	13.7	11.0	50.5	54.8	1,365	250	3,302	1,736	3,919	3,108	5,573	4,898	3,305	2,031	3,917	2,795	1,853	2,023	**23,236**	**16,841**	**40,077**
TOTAL	**13.2**	**8.9**	**49.1**	**54.5**	**1,522**	**325**	**5,584**	**2,316**	**5,918**	**3,804**	**7,230**	**6,287**	**3,856**	**2,409**	**4,457**	**3,140**	**2,480**	**2,619**	**31,048**	**20,900**	**51,948**
INTENTIONAL INJURIES																					
Self-inflicted injuries	8.2	6.2	36.3	37.1	0	0	263	289	343	332	165	236	21	18	5	5	3	3	**801**	**883**	**1,684**
Intentional self-poisoning by and exposure to alcohol	*100.0*	*100.0*	*39.7*	*39.0*	*7*	*10*	*150*	*188*	*269*	*300*	*154*	*214*	*39*	*38*	*18*	*7*	*4*	*4*	**641**	**761**	**1,402**
Homicide	16.6	15.7	31.7	35.5	26	17	643	124	385	117	169	54	18	7	15	9	7	13	**1,263**	**342**	**1,606**
Other intentional injuries	12.5	13.38	36.2	44.9	0	0	6	0	5	0	3	2	1	0	0	0	0	0	**14**	**3**	**17**
TOTAL	**12.7**	**8.0**	**33.6**	**36.8**	**26**	**17**	**912**	**413**	**734**	**449**	**337**	**293**	**40**	**26**	**20**	**14**	**10**	**16**	**2,079**	**1,228**	**3,307**
Ethanol and methanol toxicity, undetermined intent	100.0	100.0	43.8	36.4	4	11	59	40	70	60	69	33	23	4	12	4	11	4	**248**	**155**	**403**
Finding of alcohol in blood	100.0	100.0	38.8	43.0	4	4	30	7	46	14	18	12	7	7	4	4	4	0	**112**	**48**	**160**
TOTAL DETRIMENTAL EFFECTS			**56.7**	**58.4**	**3,671**	**2,203**	**14,199**	**7,313**	**26,139**	**13,844**	**43,538**	**19,268**	**30,597**	**11,728**	**33,488**	**16,601**	**18,443**	**15,997**	**170,075**	**86,953**	**257,028**
BENEFICIAL EFFECTS																					
Diabetes mellitus	-5.1	-2.5	63.6	66.6	0	0	-229	-111	-629	-252	-1,958	-642	-1,914	-694	-2,123	-1,017	-1,022	-739	**-7,875**	**-3,455**	**-11,329**
Ischaemic heart disease	-9.6	-5.1	66.2	72.2	0	0	-46	-13	-1,379	-238	-8,052	-1,420	-7,563	-1,916	-8,590	-3,103	-4,771	-3,060	**-30,400**	**-9,750**	**-40,150**
Cerebrovascular disease		-6.7		73.1		0		-48		-132		-378		-489		-998		-1,291		**-3,336**	**-3,336**
Ischaemic stroke	*-0.6*	*-8.5*	*70.4*	*64.9*	0	0	*0*	*-23*	*-2*	*-61*	*-7*	*-124*	*-8*	*-96*	*-14*	*-143*	*-11*	*-133*	***-41***	***-580***	***-621***
Haemorrhagic stroke		*-3.9*		*73.9*		0		*-14*		*-34*		*-113*		*-160*		*-333*		*-435*		***-1,088***	***-1,088***
Cholelithiasis	-15.0	-8.2	59.2	50.9	0	0	-157	-547	-492	-752	-843	-763	-600	-398	-655	-390	-351	-297	**-3,098**	**-3,145**	**-6,243**
TOTAL DETRIMENTAL EFFECTS			**65.2**	**68.0**	**0**	**0**	**-432**	**-719**	**-2,500**	**-1,373**	**-10,853**	**-3,203**	**-10,077**	**-3,495**	**-11,368**	**-5,509**	**-6,143**	**-5,387**	**-41,373**	**-19,686**	**-61,059**
NET EFFECTS					**3,671**	**2,203**	**13,767**	**6,594**	**23,639**	**12,471**	**32,686**	**16,065**	**20,520**	**8,232**	**22,120**	**11,093**	**12,299**	**10,610**	**128,702**	**67,267**	**195,970**

Table 4.5. Alcohol-attributable fractions and number of hospital days due to morbidity associated with alcohol by sex, age and disease category in Canada, 2002

CONDITION	AAF%		Number of hospital days																
	(all ages)		0-14 yrs		15-29 yrs		30-44 yrs		45-59 yrs		60-69 yrs		70-79 yrs		80+ yrs		TOTAL		OVERALL
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
MALIGNANT NEOPLASMS																			
Mouth and oropharynx cancers	19.9	11.5	0	0	52	31	527	179	2,507	607	2,182	544	1,649	578	502	345	**7,420**	**2,284**	**9,704**
Oesophageal cancers	22.8	14.7	0	0	16	10	124	14	1,671	268	2,105	437	2,375	703	990	529	**7,280**	**1,962**	**9,242**
Liver cancer	18.8	13.1	0	0	24	23	162	78	1,454	337	1,211	346	1,511	718	547	543	**4,909**	**2,044**	**6,954**
Laryngeal cancer	25.7	18.6	0	0	0	4	166	8	949	162	1,673	258	1,413	399	646	99	**4,847**	**931**	**5,778**
Breast cancer	--	3.9	--	0	--	19	--	408	--	1,396	--	991	--	1,121	--	1,044	**--**	**4,979**	**4,979**
Other neoplasms	5.4	3.3	0	0	0	16	8	98	33	145	46	70	51	86	37	48	**175**	**463**	**638**
TOTAL	**21.0**	**6.5**	**0**	**0**	**93**	**102**	**986**	**785**	**6,615**	**2,915**	**7,216**	**2,646**	**6,999**	**3,605**	**2,723**	**2,609**	**24,632**	**12,663**	**37,295**
NEURO-PSYCHIATRIC CONDITIONS																			
Alcoholic psychoses	100.0	100.0	0	0	3,306	1,509	8,658	4,051	13,495	4,829	8,178	2,783	7,118	2,286	2,266	1,149	**43,023**	**16,606**	**59,629**
Alcohol dependence syndrome	100.0	100.0	0	0	4,802	2,700	17,696	10,308	31,927	12,162	23,726	7,666	19,999	7,052	5,995	2,993	**104,144**	**42,882**	**147,027**
Alcohol abuse	100.0	100.0	0	0	10,279	5,901	15,385	9,247	17,186	7,416	9,467	3,593	9,908	3,859	3,790	2,681	**66,015**	**32,697**	**98,712**
Unipolar major depression	6.1	1.5	0	0	3,732	949	5,862	1,735	7,162	2,174	3,951	1,345	5,260	2,443	3,828	3,007	**29,795**	**11,652**	**41,447**
Degeneration of nervous system due to a	100.0	100.0	0	0	43	0	372	262	2,002	679	2,383	848	1,387	528	326	84	**6,512**	**2,401**	**8,914**
Epilepsy	25.0	19.3	0	0	3,072	2,139	5,022	2,962	6,828	4,514	4,080	3,056	4,259	4,139	2,333	3,567	**25,594**	**20,377**	**45,970**
Alcoholic polyneuropathy	100.0	100.0	0	0	3	0	31	33	258	280	519	153	379	0	19	33	**1,209**	**499**	**1,708**
TOTAL	**28.7**	**11.9**	**0**	**0**	**25,236**	**13,199**	**53,027**	**28,599**	**78,858**	**32,053**	**52,304**	**19,444**	**48,310**	**20,307**	**18,557**	**13,513**	**276,292**	**127,115**	**403,407**
CARDIO VASCULAR DISEASES																			
Hypertensive disease	13.8	4.8	0	0	1,907	420	7,379	2,133	36,711	9,334	48,200	14,259	67,969	29,004	47,241	37,848	**209,406**	**92,998**	**302,405**
Alcoholic cardiomyopathy	100.0	100.0	0	0	4	0	281	24	1,469	201	1,274	204	1,036	68	134	49	**4,199**	**546**	**4,745**
Cardiac arrhythmias	15.4	10.4	0	0	1,944	782	3,800	1,725	20,555	6,413	33,189	12,623	62,740	35,613	52,451	56,582	**174,679**	**113,739**	**288,418**
Cerebrovascular disease (males)	1.8		0		255		631		2,477		3,514		4,963		3,379		**15,218**		**15,218**
Haemorrhagic stroke	*5.6*		*0*		*195*		*653*		*3,302*		*6,078*		*9,923*		*7,821*		**27,972**		**27,972**
Oesophageal varices	32.4	25.3	0	0	90	36	442	225	1,863	622	1,183	463	865	546	403	281	**4,846**	**2,174**	**7,019**
TOTAL	**11.6**	**6.9**	**0**	**0**	**4,200**	**1,238**	**12,534**	**4,108**	**63,075**	**16,570**	**87,360**	**27,549**	**137,573**	**65,232**	**103,607**	**94,760**	**408,348**	**209,457**	**617,804**
DIGESTIVE DISEASES																			
Alcoholic gastritis	100.0	100.0	0	0	195	82	1,077	414	1,323	471	929	383	746	105	297	4	**4,568**	**1,458**	**6,026**
Cirrhosis of the liver	34.7	26.9	0	0	939	163	5,666	3,102	22,607	7,626	15,441	6,411	10,953	6,471	2,871	2,571	**58,477**	**26,344**	**84,822**
Acute and chronic pancreatitis	14.5	7.2	0	0	895	527	2,981	1,176	5,107	1,906	2,596	1,022	2,243	1,243	1,219	1,138	**15,042**	**7,012**	**22,054**
Chronic pancreatitis (alcohol induced)	59.5	59.5	0	0	155	72	2,065	498	2,782	908	1,075	248	608	89	42	32	**6,727**	**1,848**	**8,575**
TOTAL	**29.2**	**18.2**	**0**	**0**	**2,184**	**844**	**11,790**	**5,190**	**31,819**	**10,911**	**20,042**	**8,064**	**14,550**	**7,909**	**4,429**	**3,745**	**84,814**	**36,663**	**121,477**
SKIN DISEASES																			
TOTAL (Psoriasis)	**15.7**	**9.7**	**0**	**0**	**152**	**123**	**443**	**251**	**1,057**	**306**	**831**	**269**	**677**	**421**	**479**	**473**	**3,638**	**1,842**	**5,480**

Table 4.5 : Continued

CONDITION	AAF%		Number of hospital days																
	(all ages)		0-14 yrs		15-29 yrs		30-44 yrs		45-59 yrs		60-69 yrs		70-79 yrs		80+ yrs		TOTAL		OVERALL
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
CONDITIONS ARISING DURING THE PERINATAL PERIOD (MATERNAL USE)																			
Low birth weight & short gestation	6.8	6.8	16,479	14,042	--	--	--	--	--	--	--	--	--	--	--	--	**16,479**	**14,042**	**30,521**
Fetal alcohol syndrome	100.0	100.0	1,490	1,052	868	733	102	154	37	48	0	0	0	0	0	0	**2,497**	**1,987**	**4,484**
TOTAL	**100.0**	**100.0**	**17,969**	**15,094**	**868**	**733**	**102**	**154**	**37**	**48**	**0**	**0**	**0**	**0**	**0**	**0**	18,976	16,029	35,004
UNINTENTIONAL INJURIES																			
Motor vehicle accidents	15.7	7.0	392	196	8,989	1,191	4,911	1,152	2,627	1,075	582	394	744	513	369	373	**18,614**	**4,893**	**23,507**
Poisonings	4.7	3.9	0	0	298	177	254	173	263	415	134	157	89	147	69	127	**1,107**	**1,196**	**2,303**
Accidental poisoning & exposure to alcohol	*1.0*	*1.0*	*48*	*34*	*166*	*133*	*375*	*269*	*259*	*182*	*180*	*11*	*27*	*24*	*33*	*12*	***1,087***	***665***	***1,752***
Falls	4.5	1.6	0	0	1,456	383	2,308	876	4,447	4,076	2,969	1,711	4,035	2,228	6,172	5,899	**21,388**	**15,173**	**36,560**
Fires	10.6	4.8	83	33	348	20	224	65	209	54	70	18	112	26	25	16	**1,072**	**231**	**1,303**
Drownings	6.4	5.0	0	0	15	5	19	3	6	5	3	2	4	2	3	3	**50**	**20**	**70**
Other unintentional injuries	7.8	6.1	7,638	1,699	14,139	8,080	20,550	16,006	38,539	30,777	27,308	17,028	34,694	25,883	20,620	25,842	**163,488**	**125,316**	**288,803**
TOTAL	**7.6**	**4.8**	**8,114**	**1,928**	**25,245**	**9,855**	**28,267**	**18,275**	**46,091**	**36,402**	**31,065**	**19,309**	**39,678**	**28,799**	**27,259**	**32,260**	205,718	146,829	352,547
INTENTIONAL INJURIES																			
Self-inflicted injuries	4.9	3.8	0	0	1,045	1,108	1,493	1,352	850	1,159	149	145	49	45	28	24	**3,614**	**3,834**	**7,449**
Intentional self-poisoning by and exposure to alcohol	*59.5*	*59.5*	*4*	*37*	*306*	*383*	*782*	*784*	*696*	*562*	*221*	*185*	*198*	*24*	*4*	*30*	***2,211***	***2,005***	***4,216***
Homicide	9.5	9.2	84	52	1,369	490	1,142	396	506	171	178	39	141	61	108	148	**3,529**	**1,358**	**4,887**
Other Intentional injuries	7.1	7.7	0	0	18	2	23	0	10	6	0	0	1	0	0	0	**53**	**9**	**62**
TOTAL	**6.2**	**4.3**	**84**	**52**	**2,431**	**1,601**	**2,658**	**1,749**	**1,366**	**1,337**	**328**	**184**	**191**	**106**	**136**	**172**	7,196	5,201	12,397
Ethanol and methanol toxicity, undetermi	100.0	100.0	2	7	89	29	133	89	113	271	170	15	178	11	9	4	**694**	**426**	**1,120**
Finding of alcohol in blood	100.0	100.0	3	2	89	8	146	64	110	28	38	8	6	9	12	0	**404**	**119**	**523**
TOTAL DETRIMENTAL EFFECTS			**26,173**	**17,082**	**60,587**	**27,733**	**110,085**	**59,264**	**229,140**	**100,841**	**199,354**	**77,488**	**248,161**	**126,398**	**157,211**	**147,536**	1,030,711	556,343	1,587,054
BENEFICIAL EFFECTS																			
Diabetes Mellitus	-3.0	-1.5	0	0	-661	-406	-3,268	-1,269	-11,004	-3,740	-12,563	-4,614	-15,351	-7,720	-8,482	-6,498	**-51,328**	**-24,247**	**-75,575**
Ischaemic heart disease	-5.7	-3.0	0	0	-161	-35	-4,213	-896	-29,639	-5,768	-34,495	-9,757	-47,943	-18,534	-31,447	-22,316	**-147,898**	**-57,308**	**-205,206**
Cerebrovascular disease		-4.0		0		-424		-1,375		-3,379		-4,941		-11,085		-16,423		**-37,627**	**-37,627**
Ischaemic stroke	*-0.4*	*-5.1*	*0*	*0*	*-4*	*-196*	*-12*	*-559*	*-73*	*-1,276*	*-91*	*-1,272*	*-152*	*-1,616*	*-105*	*-1,575*	***-436***	***-6,494***	***-6,930***
Haemorrhagic stroke		*-2.3*		*0*		*-148*		*-444*		*-994*		*-1,562*		*-3,962*		*-6,049*		***-13,159***	***-13,159***
Cholethiasis	-8.6	-4.7	0	0	-349	-914	-1,155	-1,408	-2,703	-1,837	-2,447	-1,217	-3,355	-1,846	-2,412	-2,058	**-12,420**	**-9,281**	**-21,701**
TOTAL BENEFICIAL EFFECTS			**0**	**0**	**-1,171**	**-1,780**	**-8,636**	**-4,948**	**-43,345**	**-14,725**	**-49,504**	**-20,529**	**-66,649**	**-39,186**	**-42,341**	**-47,296**	-211,647	-128,463	-340,109
TOTAL NET EFFECTS			**26,173**	**17,082**	**59,416**	**25,953**	**101,449**	**54,316**	**185,795**	**86,116**	**149,850**	**56,959**	**181,513**	**87,212**	**114,869**	**100,241**	819,065	427,880	1,246,945

Categories in italic are sub-categories of immediate prior category

Overall in 2002-2003 fiscal years, there were 195,970 net hospital separations attributable to alcohol in Canada, accounting for 1,246,945 net hospital days in acute care hospitals. Tables 4.4 and 4.5 provides the estimates of alcohol-attributable diagnoses and hospital days caused and prevented by alcohol consumption, respectively. Overall, in Canada, there was an estimated 195,970 alcohol-attributable diagnoses among hospital separations from acute care facilities, accounting for 128,702 hospital separations among men and 67, 267 among women.

The 195,970 diagnoses is a net figure, i.e. including estimates of hospital separations prevented by alcohol (61,059). Most of the estimated hospital separations prevented by alcohol were from ischaemic heart disease (40,150 hospital separations).

Among total acute care hospital diagnoses attributable to alcohol, the three main contributors were neuropsychiatric conditions (37%), cardio-vascular disease (27%), and unintentional injuries (26.5%). With respect to single disease categories within the larger categories, mouth & oropharynx cancer (1,591 hospital separations, men: 1182, women: 409) within cancers; alcohol dependence syndrome (25,867 hospital separations, men: 18,290, women: 7,577) within neuropsychiatric conditions; hypertensive disease (52,167 hospital separations, men 37,487; women: 14, 680) within cardio-vascular diseases; cirrhosis of the liver (12,126 hospital separations, men 8,619; women: 3,407) within digestive diseases; and other unintentional injuries (40,077 hospital separations, men: 23,236; women: 16,841) within injuries constituted the largest alcohol-attributable categories (Table 4.4).

Table 4.5 shows the number of hospital days due to alcohol-attributable diagnosis in acute care facilities in Canada in 2002. Overall, there were 1,587,054 hospital days used due to alcohol (556,343 women; 1,030,711 men). In all, 340,109 hospital days were prevented due to alcohol,

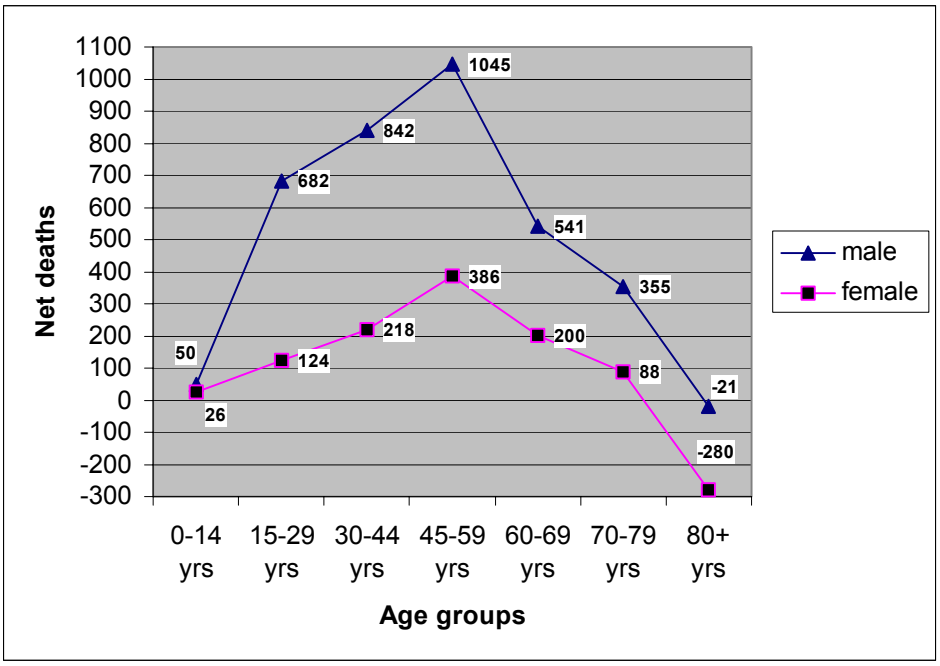
with ischaemic heart disease contributing the greatest savings at 205,206 days prevented.[12] The major medical contributors to hospital days used were identical to those of hospital separations, with the three biggest contributors being cardiovascular diseases (38.9%), neuropsychiatric disorders (25.4%), and unintentional injuries (22.2%). Individual medical conditions contributing to hospital time also showed similar trends to the hospital separation data in terms of dominant contributors: mouth and oropharynx cancer (9,704, men: 7,420, women: 2,284), alcohol dependence syndrome (147,027, men: 104,144, women: 42,882), hypertensive disease (302,405, men: 209,406, women: 92,998), liver cirrhosis (84,822, men: 58,477, women: 26,344), other unintentional injuries (288,803, men: 163,488, women: 125,316).

Balancing beneficial and detrimental effects of alcohol

This section summarizes the findings on recent alcohol-attributable mortality and morbidity for Canada. Figure 4.1 provides an overview of the net effects of alcohol consumption on mortality by sex and age. In the age group under 70, 4,115 of all net deaths were attributed to alcohol in Canada in 2002 (3,160 men and 955 women). This represents 6.2% of all Canadian deaths in this age-group.

[12] "Hospital days prevented from alcohol" refers to the estimated number of days in a hospital that were avoided due to the beneficial health effects of moderate consumption of alcohol.

Figure 4.1: Alcohol-attributable net deaths in Canada, 2002, by sex and age



In sum, the overall net effect of alcohol consumption on mortality in Canada is quite detrimental. There is a positive net effect for both males and females in the case of only one age group (Canadians over 80 years old). However, there is reason to believe, that it is artificially high (see Discussion section below). Second, the detrimental effects are clearly more prevalent in males compared to females. Thirdly, the age groups most affected by the detrimental effects of alcohol are those 30 to 44 years old and 45 to 59 years old – particularly males, followed by males aged 15-29. Finally, consumers not only experience the detrimental effects of alcohol, but third party members are also affected. Examples of third party health effects are a mother's alcohol intake on her newborn baby, or of a drunk driver's reckless driving on pedestrians.

From a public health perspective, prevention efforts should include a greater focus on groups most afflicted, i.e. males between 30 and 59 years, and strive to prevent the most prevalent

detrimental alcohol-attributable health conditions in these age groups, especially alcohol-attributable injuries.

Figure 4.2: Alcohol-attributable net hospital days in Canada, 2002, by sex and age

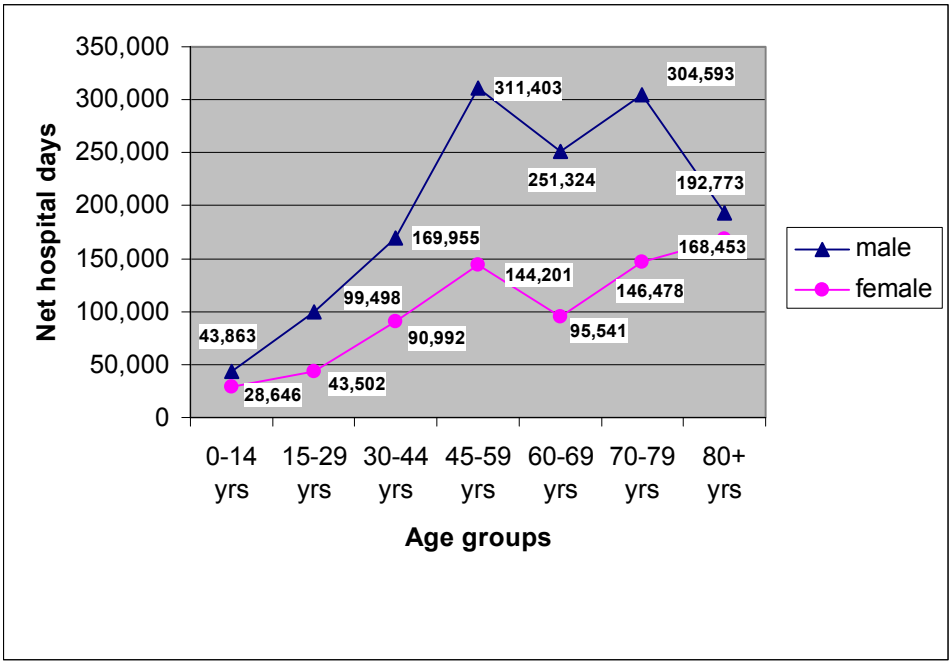


Figure 4.2 displays alcohol-attributable net hospital days in Canada by gender and age for 2002. Looking at morbidity, there is a large net detrimental effect of alcohol, which is true for all age groups and for both genders. Again, the detrimental effects of alcohol are more pronounced in men compared to women. In contrast to the age specific patterns for mortality, there is not a marked decline in alcohol-attributable morbidity for individuals aged 60 and older.

Discussion: alcohol-attributable mortality and morbidity in Canada

Overall, the net burden of disease resulting from alcohol consumption in Canada is huge and the associated costs are considerable (see Single et al., 1996, for the last estimate; see below for the results of the current cost study). Alcohol consumption has thus substantial consequences for public health (Rehm et al., in press).

Before we address potential ways to reduce alcohol-attributable harm, we would like to outline some of the limitations and potential problems of the present study. Exposure measurement is one of the biggest challenges in alcohol epidemiology. While we have relatively good *per capita* estimates (Rehm et al., 2003a), at least in countries like Canada with relatively small proportions of unrecorded consumption, the distribution by sex and age, as derived from surveys, is problematic. The main problem is that surveys account for 60% or less of sales/production figures (see footnote in Chapter 2 above). This has been known for some time (e.g. Midanik, 1988), but has not been adequately addressed in epidemiological studies. The underlying measures of exposure also explain some of the variation between studies, where little or no net loss of mortality could be measured (e.g., Single et al., 1996; Britton et al., 2003; White et al., 2004) compared to studies where the net mortality is considerable (like Rehm et al., 2004; or the present study). In the studies with little or no net loss of mortality, the level of alcohol consumption was derived from surveys resulting in considerable underestimation of consumption based on sales figures.

There are other differences that which explain the variations in study results. Of particular importance is the number of disease categories included and the estimation of injury deaths (based on country-specific statistics or not). In comparison with the earlier Canadian study by Single and colleagues (Single et al., 1996), the following changes are important to consider: a decrease in the proportion of deaths in Canada due to IHD and cerebrovascular diseases, and substantial changes in the relative risk estimates for cerebrovascular diseases (compare the relative risks provided by English et al., 1995 to those from Reynolds et al.,2003). Thus, the estimated overall protective effect of alcohol consumption has decreased in recent years.

A further problem is the estimation of risk relations for chronic disease, which still mostly do not take into account patterns of drinking. This may be less relevant for malignant neoplasm but certainly there is good evidence on alcohol and IHD to demonstrate that drinking patterns play a crucial role (Puddey et al., 1999; Rehm et al., 2003c). With respect to public health research, there are examples which demonstrate this relationship. For example, in a representative follow-up study in the United States, a protective effect of average moderate consumption could be found in Whites, but not in African Americans (Sempos et al., 2002; for a Canadian example on the relevance of patterns see Murray et al., 2002). Thus, the burden estimates for all diseases where patterns are important can only be considered preliminary until we have a better understanding of the patterns of consumption in a population and the resulting disease outcomes. This point is especially important in the area of cardiovascular disease outcomes, where patterns of drinking may transform the beneficial effects of alcohol to become detrimental (Gmel et al., 2003).

Thirdly, as indicated above, the age specificity of relative risks between exposure and outcomes needs to be considered. For example, the relative risk of alcohol for IHD declines with age (Abrams et al., 1995), but in most estimations of alcohol-attributable harm, including in this paper, the same relative risks have been used for all age groups. This leads to an overestimation of mortality and morbidity caused and prevented by alcohol in older age groups. This is especially relevant for IHD deaths prevented, where we almost certainly get a significant overestimate using the current methodology. In fact, most of the beneficial effects of alcohol would disappear if age-specific relative risk estimates were used.

While these details are certainly important in improving future estimations of burden of mortality and morbidity from alcohol, they should not detract from the main result of this study. Namely that alcohol consumption in Canada is associated with or causes a considerable burden of

mortality and disease. And this burden can also be seen when a completely different methodology is used: by comparing aggregate changes in alcohol consumption and changes in outcomes over time. A series of papers on alcohol-attributable mortality using this methodology found very similar relationships with alcohol consumption (Norström, 2004: Ramstedt, 2003, 2004, 2005; Rossow, 2004; Skog, 2003). Thus, the overall conclusions stated on alcohol-attributable harm are well-supported.

5) Alcohol-attributable detrimental social outcomes

This section provides information on the social consequences of alcohol consumption with a specific focus on family violence and criminal behaviour. While it is beyond the scope of this paper to cover all detrimental social consequences associated with alcohol consumption these two examples offer a window into the general area of social harm associated with drinking in Canada.

Figure 5.2 provides an overview of alcohol-attributable detrimental social outcomes, based on two recent overviews (Klingemann & Gmel, 2001; Babor et al., 2003):

Social consequences

- Violence
- Vandalism
- Public disorder
- Other forms of criminal behaviour
- Family problems: divorce/marital problems; child abuse
- Other interpersonal problems
- Financial problems
- Work-related problems
- Educational difficulties
- Social costs

Alcohol and family violence

Before discussing the impact of alcohol on family violence, we would like to present a very brief overview of the current knowledge on alcohol and violence (see also Rehm et al., 2003b, for a

brief introduction; Wells & Graham, 2003). Violence is often recognized as a major social problem that poses a growing challenge to health and social service providers (Jackson, 2003). Romelsjö (1995) has reviewed several research studies on the relationship between alcohol and violence. He points out that a large proportion of perpetrators and victims of violence were drinking at the time of the violent act. Research also suggests that alcohol consumption is a contributing cause in aggression and violent behaviour involving injury (Bushman, 1997; Martin & Bachman, 1997; Sharps et al., 2001). Other studies have found that involvement in alcohol-attributable aggression and violence is more likely among people who are heavy drinkers, especially those who have a drinking pattern characterized by drinking large amounts (binge drinking) or drinking to intoxication (Dawson, 1997; Giesbrecht & West, 1997; Room et al., 1995; Rossow, 1996).

Heavy drinking is a strong and consistent risk factor for violent behavior (see also above). This can be attributed to several factors: such as physiological and psychopharmacological consequences of alcohol consumption; individual expectations regarding the effects of alcohol use; and various other factors, including the setting and social context in which drinking occurs (Wells & Graham, 2003). Such risk factors can act in combination with other individual, situational, and socio-cultural factors to facilitate involvement in violent behavior within a family.

Understanding the connection between family violence and alcohol abuse is an important area of research. Family violence constitutes a major social problem in many societies (WHO, 2005). For example, one study reports that the proportion of women who report alcohol consumption by their partners just prior to a injury causing incident is greater than 50% among those receiving emergency room treatment for their injuries (Kyriacou et al., 1999). Alcohol intoxication at the time of a homicide was reported by more than 50% of defendants accused of murdering their spouses (Bureau of Justice Statistics US, 1994).

Multiple studies have found a fairly strong relationship between inappropriate and hazardous use of alcohol and the occurrence of spouse abuse, marital difficulties and family disruption (Gortner, et al., 1997; Jacob et al., 1978; Roizen, 1993; Schumacher et al., 2001). Over a 15-month period, alcohol consumption and violence were examined between male-female partners: days of the male partners' alcohol use were associated with a significant increase in male-to-female physical aggression (Fals-Stewart et al., 2003). Notwithstanding the perpetrator's gender, children and extended family are also victims of spousal abuse (Dube et al., 2002; Holmila, 1995). The psychological, emotional and behavioural negative impact on children of alcoholic parents has been documented (Holmila, 1995; Kelleher et al., 1994; Steinhausen, 1993). Parental alcohol abuse potentially increases the risk of child physical and sexual abuse and neglect (see Fleming et al. 1997; Miller et al. 1997). In most developed countries alcohol consumed by men is roughly three times the amount consumed by women in the population. The victims of family violence are usually women and children. One study shows the prevalence of partner violence of alcoholic men as nearly six times higher than it is among demographically matched non-alcoholic men (O'Farrell & Murphy, 1995).

However, partner violence by females is also very common. Studies show that a high proportion of women who are alcohol dependent engage in violence toward their male partners: 50-60% of female alcoholic patients demonstrated violent behaviour and 25-35% demonstrated violent behaviour in the year before treatment (Chase et al., 2003; Chermack et al., 2001). In addition, several studies found a linear relationship between dose of alcohol and partner violence (Chermack et al., 2001; Edwards et al., 1994; Murphy et al., 2001). In other words, the higher the BAC of the likely perpetrator, the more likely that partner violence would be an outcome of a heavy drinking episode.

In sum, there is ample evidence, that alcohol is a contributing factor in family violence. Two causal pathways, which may interact, should be separated: First, alcohol use may have a causal role in the situation, both mediated by physiological mechanisms and by expectancies. Second, there is a correlation between chronic abuse of alcohol and violence, where the causal direction is less clear.

Alcohol-attributable criminal behaviour in Canada, 2002

Criminal behaviours attributable to alcohol are defined here as acts which would not have been committed without the presence of alcohol in (Canadian) society.

Two kinds of offences can be identified within this category. Alcohol offences are typically offences in which a person has used alcohol in a situation, where such use is forbidden (e.g. , participating in traffic with a blood alcohol level of more than 80 mg% or underage drinking). Other alcohol offences with 100% attributable fraction (AF) are related to illegal production or importation of alcohols and other violations of provincial liquor regulations

Some other offences attributable to alcohol use may not be entirely related to drinking behaviour. When alcohol use is only a contributing cause to offences, this is referred to as alcohol-attributable offences. For such offences, the exact proportion of alcohol involvement has to be determined. Two types of pathways between substance abuse and criminal behaviour can be separated (Goldstein, 1985):

- Intoxication leading to criminal activity, not being committed otherwise (psycho-pharmacological model).
- The state of alcohol dependence is often related to regular heavy use, and the financial needs to procure the drugs needed may lead to criminal behaviour. Thus, criminal acts

can be committed by individuals as a means of obtaining funds or goods to maintain their dependence on psychoactive substances (economic-compulsive model).

The latter model is associated more with drug dependency, but has proven to be relevant for alcohol as well.

Methodology underlying the tables on criminal behaviour

Definitions and methods used

Crimes/charges associated with alcohol use are impaired driving, underage drinking, illegal production or importation of alcohols and other violations of provincial liquor regulations, some violent crimes (e.g., homicide, assault, robbery, etc.) and other crimes attributable to alcohol (e.g. property crime). Rehm et al. (in press) examined the available statistics and estimated the attributable fraction of traffic accidents related to alcohol intoxication to be 24.4% in Canada for the year 2002.[13] The proportion of non-traffic crimes attributable to alcohol were based on estimates from the work of Brochu and Pernanen (Brochu et al., 2005; Pernanen et al., 2002). The study by Brochu et al. (2005) was conducted as part of the Canadian cost study and provides sex-specific AFs from provincial inmates examinations in Ontario for all crimes which do not have an AF of 100%.

These estimates from Brochu and colleagues are based on interviews with prison inmates. These interviews sought to solicit answers about the roles of different substances before and during an offence. Specifically, the questions related to some aspects of the psycho-pharmacological and economic-compulsive models described above. For national estimates of Afs for males, we relied on the work of Pernanen and colleagues (2002). As no women had

[13] The underlying AFs for traffic accidents are 26.1% male and 11.7% female. The 24.4% were derived from a weighted average, and as the overwhelming majority people convicted for traffic offences were males, the proportion for both gender is relatively close to the proportion of males.

been interviewed in federal prisons, the national AFs for women are based on the male estimates, in addition to the provincial ratio between male and female AFs.[14] In the case of criminal offences related to both alcohol and illegal drugs, the figures were allocated proportionally to the AFs for single substances. All numbers were weighted by sample size of interviews. This resulted in the following AFs: 27.1% of non-alcohol specific offences[15] by men were attributable to alcohol, and 10.3% for women in the same category. To derive an overall AF for both sexes, the gender ratio from the number of people being charged with a crime was applied to the above AFs, thereby producing an overall AF of 25.4% for alcohol.[16]

To estimate AFs for provincial prison inmate populations, we again weighted the sex-specific AFs based on their sample size to come up with an overall fraction of crimes attributable to alcohol for Ontario and Quebec. The respective proportions were: male: 25.4; female: 9.7; (AF of combined sex for alcohol: 23.8%).

The AFs of violent crimes associated with alcohol were provided in Pernanen and colleagues (2002, table 6.8) report: 28% for alcohol only, 5% for illegal drugs only and 16% for both alcohol and illegal drugs. To isolate the alcohol-specific portion of the interaction effect of alcohol and illegal drugs (16%), we used a formula[17] based on the proportion of prevalence of single substance-attributable offences that resulted in an AF of 42% for alcohol and 7% for illegal drugs.

[14] There had been interviews with female prison inmates in provincial prisons, so the proportion between alcohol involvement in men vs. women could be determined.
[15] Non-alcohol specific offences are those where alcohol is not part of the definition of the offence. Examples of alcohol specific offences include: drinking and driving offences, serving to minors, public intoxication.
[16] Since more men than women were charged with the crimes analyzed, a weighted average of the two AF figures was calculated, rather than a simple average.
[17] AF for Alcohol = 0.28 + {0.28/(0.28+0.05)*.16}= 0.42

Sources of data

Crime data were obtained from the Canadian Centre for Justice Statistics (2002a,c) . Sentencing data for provincial and federal custody were obtained from Adult Correction Services in Canada (Canadian Centre for Justice Statistics, 2002a). Sentencing data for youth offences were taken from the Canadian Centre for Justice Statistics (2002b).

Alcohol-attributable crimes, charges and incarcerations

Crimes

According to the information available for 2002, it was estimated that 30.4% of all criminal offences were related to alcohol in Canada. It was thus determined that 761,638 crimes were attributable to alcohol. Among those crimes attributable to alcohol, 605,599 are violations of provincial statutes (79.5%), 28,655 crimes were due to alcohol induced impaired driving (3.8%), and 127,383 crimes (16.7%) were violent and due to alcohol. Details of the calculations are presented in Table 5.1.

Charges

It was estimated that 35.8% of all criminal charges dealt with courts are related with in court were related to alcohol in Canada 2002. 206,594 charges were attributable to alcohol which comprised of 126,135 (61.1%) provincial statute violations, 19,690 (9.5%) charges due to alcohol induced impaired driving, and 60,769 violent crime charges (29.4%). Details of the calculations and costs are presented in Table 5.2.

Incarcerations

Those incarcerations attributable to alcohol involve the total number of sentencing to provincial custody, total youth offenders sentenced to provincial custody and total number of sentencing to federal custody. It was estimated that 24,236 provincial sentences were caused by alcohol and

4,271 sentences involved violent crimes. Similarly, 2,103 youth offenders were sentenced to provincial custody. Among them, 371 were sentenced for violent crimes. The total number of federal custodial sentences due to alcohol-attributable offences was 1,823 out of 7,659 sentences. Details of the calculations and costs are presented in Table 5.3 for Canada in 2002.

Table 5.1. Alcohol-attributable crimes: provinces, territories, and Canada, 2002

	Canada	BC	Alberta	Sask	Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	PEI	Nfld	Yukon	Northwest Territories	Nunavut
Population	31,414,000	4,141,272	3,113,586	1,011,808	1,150,848	12,068,301	7,455,208	756,652	944,765	139,913	531,595	29,924	41,403	28,715
Incidence data: Total crimes excl. traffic	2,384,247	478,347	289,873	135,262	129,935	732,930	424,732	50,001	71,890	10,673	31,003	7,995	13,340	8,266
Criminal code traffic accidents	117,633	15,037	16,388	10,218	3,809	35,450	28,174	2,711	2,832	651	1,335	357	544	127
Total crime incidents	2,501,880	493,384	306,261	145,480	133,744	768,380	452,906	52,712	74,722	11,324	32,338	8,352	13,884	8,393
Violent crime incidents	303,294	49,641	33,539	18,331	18,925	99,990	53,625	7,373	10,380	1,210	4,751	1,137	2,355	2,037
Alcohol-attributable crimes: provincial statutes	605,599	121,500	73,628	34,357	33,003	186,164	107,882	12,700	18,260	2,711	7,875	2,031	3,388	2,100
Criminal code impaired driving	28,655	3,663	3,992	2,489	928	8,636	6,863	660	690	159	325	87	133	31
Violent crimes due to alcohol	127,383	20,849	14,086	7,699	7,949	41,996	22,523	3,097	4,360	508	1,995	478	989	856
Alcohol-attributable total crimes	**761,638**	**146,012**	**91,706**	**44,545**	**41,880**	**236,796**	**137,268**	**16,457**	**23,310**	**3,378**	**10,195**	**2,595**	**4,510**	**2,986**
Alcohol-attributable crimes as % of all crimes	**30.4%**	**29.6%**	**29.9%**	**30.6%**	**31.3%**	**30.8%**	**30.3%**	**31.2%**	**31.2%**	**29.8%**	**31.5%**	**31.1%**	**32.5%**	**35.6%**

Source for Crime Statistics: Canadian Crime Statistics 2002. catalogue no. 85-205-XIE

Source for Crime Statistics: Canadian Crime Statistics 2002. catalogue no. 82-221-XIE

For liquor licensing Quebec and Ontario estimates of 1992 were used and inflated to 2002 (19.36%) then estimated based on per capita average in Ontario and Quebec

Table 5.2. Alcohol-attributable charges: provinces, territories, and Canada, 2002

	Canada	BC	Alberta	Sask	Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	PEI	Nfld	Yukon	Northwest Territories	Nunavut
Total charges excl. traffic	496,594	64,336	68,932	37,861	32,346	176,977	78,048	9,683	14,065	1,500	7,185	1,273	2,443	1,945
Criminal code traffic accidents - charges	80,830	9,336	13,219	6,254	3,189	24,073	18,285	2,216	2,179	447	978	219	372	63
Total charges	577,424	73,672	82,151	44,115	35,535	201,050	96,333	11,899	16,244	1,947	8,163	1,492	2,815	2,008
Violent crime charges	144,689	20,049	15,552	8,484	10,611	52,577	25,780	2,650	4,317	430	2,039	383	893	924
Alcohol-attributable Charges: provincial statutes	126,135	16,341	17,509	9,617	8,216	44,952	19,824	2,459	3,573	381	1,825	323	621	494
criminal code impaired driving	19,690	2,274	3,220	1,523	777	5,864	4,454	540	531	109	238	53	91	15
Violent crime charges due to alcohol	60,769	8,421	6,532	3,563	4,457	22,082	10,828	1,113	1,813	181	856	161	375	388
Alcohol-attributable total charges	**206,594**	**27,036**	**27,261**	**14,703**	**13,449**	**72,899**	**35,106**	**4,112**	**5,916**	**670**	**2,920**	**538**	**1,086**	**897**
Alcohol-attributable charges as % of all charges	**35.8%**	**36.7%**	**33.2%**	**33.3%**	**37.8%**	**36.3%**	**36.4%**	**34.6%**	**36.4%**	**34.4%**	**35.8%**	**36.0%**	**38.6%**	**44.7%**

Source for Crime Statistics: Canadian Crime Statistics 2002. catalogue no. 85-205-XIE

Source for Crime Statistics: Canadian Crime Statistics 2002. catalogue no. 82-221-XIE

Table 5.3. Alcohol and drug-attributable provincial and federal prison sentences: provinces, territories, and Canada, 2002

	Canada	BC	Alberta	Sask	Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	PEI	Nfld	Yukon	Northwest Territories	Nunavut
Population	31,414,000	4,141,272	3,113,586	1,011,808	1,150,848	12,068,301	7,455,208	756,652	944,765	139,913	531,595	29,924	41,403	28,715
Total Sentenced to Provincial Custody	83,885	8,740	16,190	3,576	3,316	33,050	13,423	1,458	1,376	594	1,031	206	685	240
Sentenced for alcohol offence	**19,965**	**2,080**	**3,853**	**851**	**789**	**7,866**	**3,195**	**347**	**327**	**141**	**245**	**49**	**163**	**57**
Sentenced for violent crime: alcohol	**4,271**	**445**	**824**	**182**	**169**	**1,683**	**683**	**74**	**70**	**30**	**52**	**10**	**35**	**12**
Total youth offenders sentenced to provincial custody*	7,278	563	1,038	873	277	3,031	819	235	24	39	282	18	53	26
Sentenced for alcohol offence	**1,732**	**134**	**247**	**208**	**66**	**721**	**195**	**56**	**6**	**9**	**67**	**4**	**13**	**6**
Sentenced for violent crime: alcohol	**371**	**29**	**53**	**44**	**14**	**154**	**42**	**12**	**1**	**2**	**14**	**1**	**3**	**1**
Total sentenced to Federal Custody	7,659	896	1,305	424	482	1,904	1,758	277	346	51	194	6	9	6
Sentenced for alcohol offence	**1,823**	**213**	**311**	**101**	**115**	**453**	**418**	**66**	**82**	**12**	**46**	**2**	**2**	**1**

Provincial totals taken from catalogue 85-211, Table 6

Federals totals taken from catalogue 85-211, Table 28

Alcohol figures attained by adding impaired driving with liquor offences (pages 20 and 21 in catalogue 85-211)

Alcohol offence includes both impaired driving and "other criminial code traffic" offence (less than 5% are these other ones)

Youth offender costs were available for 1998/99 hence been inflated for fiscal year 2002/2003

Youth offenders sentenced - Juristat Cat. No 85-002 vol. 24(2) table 5 (only those sentenced to secured custodies are counted)

Overall, the estimates provided above indicate that there is considerable criminality as a consequence of alcohol use. A major problem at this point is the basis for this estimation. Offender self-reports may not be the most valid method to quantitatively estimate alcohol-attributable criminality. For example, the mention of alcohol may be made in order to exonerate oneself or to relieve one's conscience (i.e. an offender's admission that alcohol played a part in his/her behaviour may allow him/her to acknowledge committing crime). It is also not clear about the degree to which alcohol could have been fully or partly replaced by other substances in a particular situation.[18]

On the other hand, to our knowledge this methodology based on offenders' self reports is the only one which allows us to empirically derive AFs and has been developed as a standard for studies of this type. Thus, the numbers displayed above seem to be the best available.

[18] In a hypothetical scenario where other substances, with similar psychoactive effects, act as a substitute for alcohol, restricting access to alcohol would not result in fewer crimes.

6) The social costs of alcohol abuse to Canadian society[19]

It was estimated that there were 1,246,945 net acute care hospital days attributable to alcohol in Canada in 2002. The cost of these hospital days was estimated to be $1,458.6 million. There were 54,114 psychiatric hospital days attributable to alcohol in 2002 which translated into $19.6 million. Similarly, the cost of specialized treatment attributable to alcohol incurred $807.3 million to Canadian society. The cost of alcohol-attributable ambulatory care, family physician visits and prescription drugs were estimated at $80.2 million, $172.8 million, and $767.6 million, respectively (See Table 6.1).

In 2002, the total public policing costs in Canada were estimated at $1,898.76 million due to alcohol abuse. Court costs attributable to the processing of alcohol-attributable criminal charges were estimated to be $513.07 million. These costs include all expenses for court staff, including judges, as well as expenditures associated with legal aid services and prosecutors. Correctional costs, which include costs for penal institutions, probation and parole services for adult and young offenders at both the provincial and federal level, were estimated at $660.4 million.

Other direct costs such as prevention and research, fire damage, losses due to traffic accidents, losses associated with workplace and administrative costs attributable to alcohol were estimated at $1,049.1 million.

The cost attributable to alcohol abuse is $7,126.4 million in indirect productivity losses. Long-term disability accounted for almost $6,164 million of this cost while productivity losses due to premature mortality accounted for $923 million.

[19] All figures regarding social cost are based on the recently released second Canadian study on social costs (Rehm et al., 2006).

Table 6.1: The social costs of alcohol abuse in Canada, 2002

	(in millions dollars)
	Alcohol
1. Direct health care costs: total	**$3,306.2**
1.1 morbidity - acute care hospitalization	$1,458.6
- psychiatric hospitalization	$19.6
1.2 inpatient specialized treatment	$754.9
1.3 outpatient specialized treatment	$52.4
1.4 ambulatory care: physician fees	$80.2
1.5 family physician visit	$172.8
1.6 prescription drugs	$767.6
2. Direct law enforcement costs	**$3,072.2**
2.1 police	$1,898.8
2.2 courts	$513.1
2.3 corrections (including probation)	$660.4
3. Direct costs for prevention and research	**$53.0**
3.1 research	$17.3
3.2 prevention programs	$33.9
3.3 salaries and operating funds	$1.8
4. Other direct costs	**$996.1**
4.1 fire damage	$156.5
4.2 traffic accident damage	$756.9
4.3 losses associated with the workplace	$17.0
4.3.1 EAP & health promotion programs	*$17.0*
4.3.2 drug testing in the workplace	--
4.4 administrative costs for transfer payments	$65.8
4.4.1 social welfare and other programs	*$4.3*
4.4.2 workers' compensation	*$61.5*
5. Indirect costs: productivity losses (main scenario)	**$7,126.4**
5.1 due to long-term disability	$6,163.9
5.2 due to short-term disability (days in bed)	$15.9
5.3 due to short-term disability (days with reduced activity)	$23.6
5.4 due to premature mortality	$923.0
Total	**$14,554.0**
Total per capita (in $)	**$463.3**

"--" not available

EAP - Employee Assistance Programs

Categories in italics are sub-categories of immediate prior category

7) Beneficial psycho-social effects related to alcohol

Given the overall balance of alcohol-attributable effects on health as well as the detrimental effects reported in the previous chapters -- with those effects outweighing the beneficial effects, one must ask why so many Canadians consume alcohol and why a substantial proportion of Canadians consume it in a harmful way.

One of the primary reasons for consuming alcohol appears to be the positive psychological and social effects of drinking. In their review of the literature, Peele and Brodsky (2000) identified the following positive effects of moderate alcohol consumption[20]:

- Subjective health, i.e. the self-perception of good health
- Anticipated and experienced positive mood effects, although this effect was moderated by cultural experiences
- Stress reduction
- Sociability
- Better social integration and adjustment
- Improved mental health

Questions remain about the causal link between alcohol and the above-mentioned outcomes (e.g. Room, 2000). Nevertheless, applying the same standards of epidemiological reasoning to this field as for health outcomes (see Chapter 3 and 4 above and the criteria for causality used), the overall conclusion is that alcohol is linked to a number of psycho-social benefits. These benefits are not only situational, but previous studies have shown that there are long-term implications.

[20] The authors note other positive outcomes in other areas, e.g. beneficial effects on cognitive functioning. However, the literature on these effects is mixed. Other authors argue that there is conclusive evidence for a causal relationship (Ashley et al., 2000). The other benefits discussed by Peele and Brodsky (2000) are also less relevant to this chapter and therefore not summarized here.

At this point, it should be noted that the above-mentioned benefits apply almost exclusively to moderate drinking – such as one or two standard drinks a day. In contrast, using the same standards, extensive research indicates that heavy drinking contributes to a deterioration of psychological experiences and outcomes. It is therefore important to find ways to reduce or minimize heavy drinking while at the same time encourage moderate and low-risk drinking.

8) Implications for policy

The previous sections have provided information that delineates the extent and range of damage from alcohol. On balance, the damage substantially outweighs the benefits. In order to reduce the damage from alcohol, along with the attendant social and economic costs, it is necessary to not only to reflect on the extent of the problem, but also to consider what is currently known about effective interventions and policies. There is an extensive and growing body of research that summarizes evaluations of a wide range of interventions. Figure 8.1. provides an overview of evidence-based practices, which were established from a review of empirical research on alcohol policy under the umbrella of the World Health Organization (Babor et al. 2003).

Figure 8.1: Recommendations of international review on alcohol policy for best policy options

Best Practices

- Minimum legal purchase age
- Government monopoly of retail sales
- Restriction on hours or days of sale
- Outlet density restrictions
- Alcohol taxes
- Random breath testing (sobriety check points)
- Lowered BAC limits
- Administrative license suspension
- Graduated licensing for novice drivers
- Brief interventions for hazardous drinkers

(cf. Babor et al., 2003)

In Table 8.1, some potential interventions (far right column) are presented in connection with the type of damage – traumatic or chronic, and high-risk populations.

Table 8.1: Brief overview: type of health burden, high-risk populations and evidence-based interventions

Health burden	**Types**	**High risk populations**	**Interventions**
	These are examples only and they do not represent definitive or comprehensive lists		
Acute/traumatic	Drinking and driving Violence Accidents	Young adults, Lower SES Older adults	Lower BAC level & enforcement Random breath testing Server intervention & training Community interventions focusing on low SES Special programs for elderly who drink at risk
Chronic diseases or conditions	Cancers Neuro-psychiatirc conditions CVD Digestive diseases	Middle-aged heavy drinkers (predominantly male)	Controls on access to alcohol (taxes, outlet density, etc) and government run retailing. Brief interventions

The most efficient and cost-effective policy option to reduce alcohol-attributable harm is taxation (cf. Chisholm et al., 2004; Rehm et al., 2006). Given the fact, that alcohol has become relatively cheaper in Canada during the past decades, this policy should be applied. However, this does not address the specific problem of differential health implications for people with lower socioeconomic status.

Brief interventions, involving counselling, advice or guidance through printed material, are also efficient for reducing alcohol-attributable harm (Babor et al., 2003; Chisholm et al., 2004). However, this option is geared towards problem drinkers, i.e. towards people, who already

experience some problems. While there is an ethical obligation to help these people, overall, other options for preventing alcohol-attributable problems are more cost effective and preferable (see Figure 8.1.)

Other “best practices” options are available to reduce driving while under the influence of alcohol. *Per se* laws, which make it an offence by itself, or *per se*, to drive with a BAC above a certain limit (often termed the legal limit), have been implemented to expedite the removal of intoxicated drivers from the roadways and facilitate laying of charges and prosecution. These laws are considered to be the foundation of modern deterrence-based approaches to prevent collisions, injuries and deaths that result from drunk driving (Babor et al, 2003; Mann et al, 2001; Ross, 1984). Norway introduced the first *per se* law in 1936, making it an offence to drive with a Blood Alcohol Content (BAC) over the legal limit of 50 mg% (Voas & Lacey, 1990).

Canada’s current legal limit is 80 mg%. However, medical and health organizations[21] have recommended that the legal limit for driving be 50 mg%. Australia and most European countries have lowered the legal limit for driving to this level or below. There are three key issues in considering a reasonable legal limit for a jurisdiction: impairment, collision risk, and potential impact of a changed or reduced legal limit. First, it is clear that the effects of alcohol on performance can begin with the first drink . A recent study concluded that psychomotor performance is significantly impaired by 40 mg% (Eckardt et al., 1998). Second, recent epidemiological investigations provide strong evidence that collision risk is significantly elevated by the time a BAC of 50 mg% is reached. (e.g., Zador , 1991; Mayhew & Simpson, 1985).

[21] The following medical and health organizations have recommended a lower legal limit: the Canadian Medical Association, the Canadian Public Health Association, the Ontario Public Health Association, the Centre for Addiction and Mental Health, the Ontario Medical Association, the American Medical Association and the British Medical Association

Other studies have explored the impact of introducing or lowering a particular BAC level. They have all concluded that introducing or lowering legal limits in *per se* laws reduces deaths, injuries and collisions resulting from drunk driving (Asbridge et al., 2004; Babor et al., 2003; Chamberlain & Solomon, 2002; Mann et al., 1998, 2001; Shults et al., 2001; Tippets et al., 2005; Voas et al., 2002). In New South Wales and Queensland, Australia, studies controlling or the effects of such factors as alcohol consumption levels, economic activity and road conditions found significant reductions in total driver fatality rates of 8% and 18% respectively when the legal limit was lowered from 80 to 50 mg% (Henstridge et al, 1997). Research also demonstrates that the introduction of reduced legal limits should be accompanied by efforts to increase public awareness and support high-profile enforcement efforts to maximize the beneficial effects of the policy (Mann et al, 2001).

Most Canadian provinces have brief roadside suspensions of 12 or 24 hours that can be applied at BACs of 50 mg%, but these brief suspensions have been ineffective in reducing collisions and related mortality rates (Vingilis et al, 1988; Sen, 2001). A contrast with the significant beneficial impact of Canada's original *per se* law (which reduced drinking driving fatalities in Ontario by 18% over the long term; Asbridge et al, 2004) suggests that the length of license suspension is a key factor in promoting the desired effect of these laws. Consistent with this, in Saskatchewan, Quaye and Boase (2002) observed that when the period of roadside suspension increased for multiple offenders to 90 days, the recidivism rate among multiple offenders declined significantly.

Several suggestions have been made in Canada to change or modify legal limits. These include changing the legal blood alcohol content from 80 mg% to 50 mg% in the current legislation (Centre for Addiction and Mental Health, 2002); introducing a new criminal offence at 50 mg% (MADD Canada, 2001), or in each province, revising the current provincial roadside

suspensions of 12 or 24 hours to include a longer suspension period such as 14 or 30 days (MADD Canada, 2003; Canadian Council of Motor Transport Administrators, 2005). Each of these options could reduce collisions and mortality rates with appropriate levels of public education and high visibility enforcement.

Other points of best practices seem to be realized in most provinces by provincial alcohol retail monopolies. This mode of retailing has been shown to best:

- guarantee the enforcement of a minimum legal purchase age
- restrict hours or days of sale, as well as
- restrict outlet density

However, while the current policies are at least in part evidence-based, they do not specifically address the problem of differential alcohol-attributable harm for the lower socioeconomic classes. These observations confirm the importance of considering the social determinants of health in the context of preventing alcohol problems. However, the concrete implications of this perspective for prevention are as yet unclear. Of course, lowering poverty and closing the gap between high and lower socioeconomic status would reduce alcohol-attributable harm, but such measures would be difficult to implement.. Thus, from a research standpoint, the most important recommendation that can be made with respect to this issue is to address alcohol problems from a determinants of health perspective.

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Appendix 1. ICD-10 codes for disease conditions attributable to alcohol and sources for determining risk relations including alcohol-attributable fractions (AAFs)

Condition	ICD-10 Code	Source for meta-analysis or AAF
Malignant neoplasms		
Oropharyngeal cancer	C00 - C14	Gutjahr et al., 2001
Oesophageal cancer	C15	Gutjahr et al., 2001
Liver cancer	C22	Gutjahr et al., 2001
Laryngeal cancer	C32	Gutjahr et al., 2001
Breast cancer	C50	Ridolfo & Stevenson, 2001
Other neoplasms	D00-D48	Rehm et al., 2004
Diabetes		
Diabetes mellitus	E10 - E14	Gutjahr et al., 2001
Neuro-psychiatric conditions		
Alcoholic psychoses	F10.0, F10.3 - F10.9	100% AAF per definition
Alcohol dependence syndrome	F10.2	100% AAF per definition
Alcohol abuse	F10.1	100% AAF per definition
Unipolar major depression	F32 - F33	Rehm et al., 2004
Degeneration of nervous system due to alcohol	G31.2	100% AAF per definition
Epilepsy	G40 - G41	Gutjahr et al., 2001
Alcoholic polyneuropathy	G62.1	100% AAF per definition
Cardiovascular diseases		
Hypertensive disease	I10 - I15	Corrao et al., 1999
Ischaemic heart disease	I20 - I25	Corrao et al., 2000; Rehm et al., 2004
Alcoholic cardiomyopathy	I42.6	100% AAF per definition
Cardiac arrhythmias	I47 - I49	Gutjahr et al., 2001
Heart failure and ill-defined complications of heart disease	I50 - I52, I23, I25.0, I97.0, I97.1, I98.1	This is an unspecific category with no identification of underlying pathology. Therefore, the relationship between average volume of consumption cannot be determined by usual meta-analysis.
Cerebrovascular disease	I60 - I69	
Ischaemic stroke	I60 - I62	Reynolds et al., 2003
Haemorrhagic stroke	I63 - I66	Reynolds et al., 2003
Oesophageal varices	I85	Gutjahr et al., 2001
Digestive diseases		
Alcoholic gastritis	K29.2	100% AAF per definition
Cirrhosis of the liver	K70, K74	Rehm et al., 2004
Cholelithiasis	K80	Gutjahr et al., 2001

Acute and chronic pancreatitis	K85, K86.1	Corrao et al., 1999
Chronic pancreatitis (alcohol induced)	K86.0	100% AAF per definition
Skin diseases		
Psoriasis	L40	Gutjahr et al., 2001
Conditions arising during the perinatal period (maternal use)		
Low birth weight & short gestation (as defined by the global burden of disease study) *	P05 - P07	Gutjahr et al., 2001
Foetal alcohol syndrome (dysmorphic)	Q86.0	100% AAF per definition
Unintentional injuries		
Motor vehicle accidents	§	Traffic Injury Research Foundation of Canada, 2004; Transport Canada, 2004
Poisonings	X40 - X49	Rehm et al., 2004; adjusted to Canada by AAF for traffic accidents
Accidental poisoning & exposure to alcohol	X45	100% AAF per definition
Falls	W00 - W19	Rehm et al., 2004; adjusted to Canada by AAF for traffic accidents
Fires	X00 - X09	Council of Canadian Fire Marshals and Fire Commissioners, 2003.
Drowning	W65-W74	Rehm et al., 2004; adjusted to Canada by AAF for traffic accidents
Other unintentional injuries	† Rest of V & W20 - W64, W75 - W99, X10 -X39, X50 - X59, Y40 -Y86, Y88, Y89	Rehm et al., 2004; adjusted to Canada by AAF for traffic accidents
Intentional injuries		
Suicide, self-inflicted injuries	X60 - X84, Y87.0	Rehm et al., 2004; adjusted to Canada by AAF for traffic accidents
Intentional self-poisoning by and exposure to alcohol	X65	100% AAF per definition
Homicide	X85 -Y09, Y87.1	Rehm et al., 2004; adjusted to Canada by AAF for traffic accidents
Other intentional injuries	Y35	Rehm et al., 2004; adjusted to Canada by AAF for traffic accidents
Ethanol and methanol toxicity, undetermined intent	Y15	100% AAF per definition
Finding of alcohol in blood	R78.0	100% AAF per definition

* Relative risk refers to drinking of mothers

§ V021-V029, V031-V039, V041-V049, V092, V093, V123-V129, V133-V139, V143-V149, V194-V196, V203-V209, V213-V219, V223-V229, V233-V239, V243-V249,V253-V259, V263-V269, V273-V279, V283-V289, V294-V299, V304-V309, V314-V319, V324-V329, V334-V339, V344-V349, V354-V359, V364-V369, V374-V379, V384-V389, V394-V399, V404-V409, V414-V419, V424-V429, V434-V439, V444-V449, V454-V459, V464-V469, V474-V479, V484-V489, V494-V499, V504-V509, V514-V519, V524-V529, V534-V539, V544-V549, V554-V559, V564-V569, V574-V579, V584-V589, V594-V599, V604-V609, V614-V619, V624-V629,

V634-V639, V644-V649, V654-V659, V664-V669, V674-V679, V684-V689, V694-V699, V704-V709, V714-V719, V724-V729, V734-V739, V744-V749, V754-V759, V764-V769, V774-V779, V784-V789, V794-V799, V803-V805, V811, V821, V830-V833, V840-V843, V850-V853, V860-V863, V870-V878, V892.
† Rest of V = V-series MINUS §

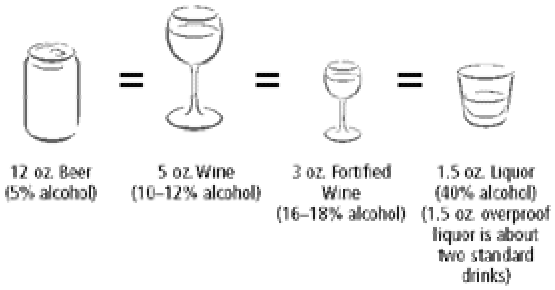
Appendix 2. Low-risk Drinking Guidelines

http://www.camh.net/about_addiction_mental_health/low_risk_drinking_guidelines.html

Maximize Life, Minimize Risk

- 0 : Zero drinks = lowest risk of an alcohol-attributable problem
- 2 : No more than 2 standard drinks on any one day
- 9 : Women: up to 9 standard drinks a week
- 14 : Men: up to 14 standard drinks a week

One Standard Drink =13.6 g of alcohol



- 5 oz/142 mL of wine (12% alcohol)
- 1.5 oz/43 mL of spirits (40% alcohol)
- 12 oz/341 mL of regular strength beer (5% alcohol).

Higher alcohol beers and coolers have more alcohol than one standard drink

- If you don't already drink, don't start for health reasons.
- If you do drink, avoid getting intoxicated or drunk.
- Wait at least one hour between drinks.
- Have something to eat. Drink non-alcoholic beverages, such as water, soft drinks or fruit juice

The Low-Risk Drinking Guidelines are for people of legal drinking age

The Guidelines do not apply if you:

- have health problems such as liver disease or mental illness
- are taking medications such as sedatives, painkillers or sleeping pills
- have a personal or family history of drinking problems

- have a family history of cancer or other risk factors for cancer
- are pregnant, trying to get pregnant or breastfeeding
- will be operating vehicles such as cars, trucks, motorcycles, boats, snowmobiles, all-terrain vehicles or bicycles
- need to be alert; for example, if you will be operating machinery or working with farm implements or dangerous equipment
- will be doing sports or other physical activities where you need to be in control
  are responsible for the safety of others at work or at home
- are told not to drink for legal, medical or other reasons

If you are concerned about how drinking may affect your health, check with your doctor.

Tips for following these Guidelines:

- Know what a standard drink is.
- Keep track of how much you drink -- daily and weekly.
- Never drink and drive -- or ride with a driver who has been drinking.
- Don't start drinking for health reasons. To keep your heart healthy, eat better, exercise more and don't smoke.
- Don't drink if you are pregnant or planning to become pregnant.
- Be a responsible host -- encourage your guests to follow these guidelines.
- Talk to your kids about alcohol.
- Find out about programs and policies that support low-risk drinking.
- Develop an alcohol policy for your home, workplace, school or community organization.

Note: These are "low-risk" guidelines. They are not "no-risk" guidelines.

You may have heard that alcohol is good for your heart. What you may not have heard is that:

- The health benefits of alcohol apply mainly to people over the age of 45. A little goes a long way. In most cases, one drink of beer, wine or liquor every other day is enough.
- For most people, more than two drinks a day does more harm than good.
- Women who have more than nine drinks a week have higher rates of cancer and other problems than women who drink less.
- Men who have more than fourteen drinks a week also have higher rates of alcohol-attributable problems.
- Young people have very low rates of heart disease but very high rates of alcohol-attributable injuries and death.

- If you want to improve your health, you're better off eating a healthier diet, getting more exercise, and giving up smoking, rather than drinking more or starting to drink.

So bring a little balance into your life... For advice on alcohol and health, talk to your doctor or other health professional or call 1-800-463-6273 (416-595-6111 in Toronto).

The Low-Risk Drinking Guidelines were developed by a team of medical and social researchers from the University of Toronto and the Centre for Addiction and Mental Health. They have been endorsed by the following organizations:

- Addictions Foundation of Manitoba
- Alberta Alcohol and Drug Abuse Commission
- Alcohol Policy Network
- Association of Local Public Health Agencies
- Best Start: Ontario's Maternal Newborn and Early Child Development Resource Centre
- Canadian Centre on Substance Abuse
- Centre for Addiction and Mental Health
- FOCUS Resource Centre
- Ontario Public Health Association
- Ontario Society of Nutrition Professionals in Public Health

For the facts on alcohol and health, or to find out about the Low-Risk Drinking Guidelines Campaign, visit www.lrdg.net.

To order additional copies of this brochure, call 1-800-661-1111 (416-595-6059 in Toronto)