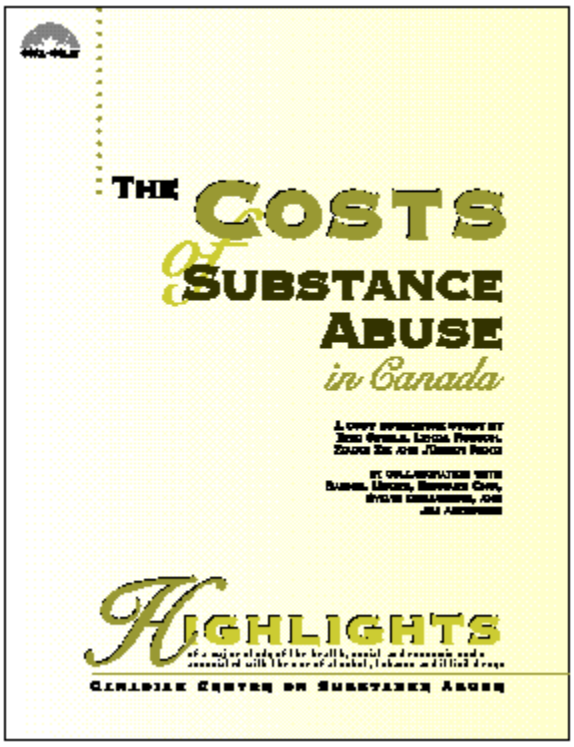

The Costs of Substance Abuse in Canada

Highlights of a major study of the health, social and economic costs associated with the use of alcohol, tobacco and illicit drugs

1996

A cost estimation study by Eric Single(1) Lynda Robson(2), Xiaodi Xie(3) and Jürgen Rehm(4). In collaboration with Rachel Moore(5), Bernard Choi(6), Sylvie Desjardins (7) and Jim Anderson (8).

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Introduction and background

This Highlights report summarizes key findings of a comprehensive study of the health, social and economic costs associated with the use of alcohol, tobacco and illicit drugs in Canada. The impact of substance abuse on society is an issue of vital importance, yet very little information exists that links this impact to familiar economic indicators such as Gross Domestic Product. Estimates of the costs associated with illicit drugs in particular are plagued by methodological difficulties that result in wide discrepancies, not only in Canada, but in many other countries as well.

In May, 1994, the Canadian Centre on Substance Abuse (CCSA) organized an International Symposium on the Economic and Social Costs of Substance Abuse. The meeting, in Banff, Alberta, brought together economists, addictions specialists and policy makers from eight countries, as well as representatives of international addictions agencies. The goal of this unprecedented gathering was to reach consensus on international guidelines for the conducting of economic cost studies. The set of guidelines that emerged reflected a remarkable degree of agreement on ways to resolve the many difficult methodological issues involved in cost estimation.

In October, 1995, a second Symposium was held in Montebello, Québec to review the results of some initial attempts to apply the guidelines to actual cost studies. Adjustments were made to the guidelines and the group moved on to discuss ways of promoting the concept of economic cost studies to a broader international community. Participants also examined the utility of cost estimates in informing policy and program development.

A Canadian cost study

The development of reliable cost estimation guidelines has paved the way for the first comprehensive study of the costs of substance abuse in Canada.

To our knowledge, there has been no attempt to estimate the total costs associated with the use and abuse of all psychoactive substances in Canada. Various studies have looked at individual costs associated with alcohol, tobacco and illicit drugs using different methodologies and relying to varying degrees on assumptions of uncertain validity and reliability. The results often vary widely. Under these circumstances, policy makers and the public can hardly be blamed if they view cost estimates on substance abuse with skepticism.

The development of reliable cost estimation guidelines has paved the way for the first comprehensive study of the costs of substance abuse in Canada. As well as taking advantage of the experience and expertise of researchers in other countries, this project involves the participation of provincial agencies which are conducting economic cost studies within their jurisdictions. This partnership is intended to foster interprovincial comparability of results and to avoid unnecessary duplication of effort. The study has been carried out by a team of people broadly representing the areas of addiction studies, health economics, epidemiology, criminology, social policy and law enforcement. These experts worked under the guidance of a steering committee

composed of representatives of government, addiction agencies, private industry and academia.

The study began by examining the research literature on estimating alcohol, tobacco and drug costs. Using the Cost of Illness (COI) approach, a detailed list of costs to be included was drawn up and existing data systems were inventoried for relevant information. In addition to estimating the economic costs of substance abuse nationally, the study attempts to develop cost estimates for each province. Where data cannot be captured provincially, the study apportions national costs in a reasonable manner.

Scope of the study

The figure of $18.45 billion, or 2.7% of GDP, represents the most optimistic estimate of this cost. The actual number could be significantly higher.

The reader is cautioned that *The Costs of Substance Abuse in Canada* is NOT a study of the budgetary impact of alcohol, tobacco and other drugs on governments. The costs included in this study relate to the whole of society and not just to government accounts. This kind of study is useful in conducting an accounting of the budgetary impact of psychoactive substances, as it provides estimates for many of the expenditures that government must make. However, government costs do not include all of the costs imposed on the community. Furthermore, the notion of budget impact includes consideration of government revenues and other benefits, which are not be part of this study.

Although this study provides a wealth of new and useful cost information, it should not be confused with a cost-benefit analysis of measures taken to reduce the harm associated with substance abuse. It takes a giant step toward making such an analysis possible, but much more work is required to set the stage. Having reliably established the costs associated with substance abuse, we now must calculate what portion of those costs is reasonably avoidable. The next step is to determine where we should invest to avoid those costs. Finally, we need to monitor the return on that investment. Only then can we determine whether the cost of substance abuse policies and programs is justified by the benefits they produce. This is the kind of information decision makers need to determine how to invest scarce resources. In the months and years to come, CCSA will be seeking broad support from the community for continued effort toward making this information readily available.

The authors of this study have taken a decidedly conservative approach to estimating the costs of substance abuse. Where data are incomplete or alternative sources yield different figures, lower estimates are generally used. Furthermore, data are completely lacking for some cost components, such as, for example, property crime related to illicit drugs. Therefore, the figure of $18.45 billion, or 2.7% of GDP, given as the total cost of substance abuse in Canada, represents the most optimistic estimate of this cost. The actual number is probably higher and could be significantly higher.

Definition of costs

Costs in this study are defined according to the concept of alternative uses for scarce resources, or opportunity costs. With certain exceptions, the major direct costs are the tangible, external costs of substance abuse; that is, those costs borne by persons other than the abuser, including the abuser's family. Although certain minor internal costs are included in Cost of Illness studies (such as the private costs of drugs for treatment, or the costs of property damage due to alcohol-related traffic accidents), the major direct costs considered are external in the Canadian context. The costs of purchasing alcohol, tobacco and illicit drugs to the users are not included. Nor are transfer payments, such as welfare benefits to people disabled by substance abuse (although administrative costs are included).

Focus on gross rather than net costs

As this is not a cost-benefit study, we generally refer to gross rather than net costs of substance abuse. The use of alcohol, tobacco and illicit drugs involves benefits as well as costs. In some instances, the use of a particular psychoactive substance will result in both an increase as well as a decrease in the incidence of an adverse consequence. Thus, for example, the use of alcohol is associated with decreased levels of coronary heart disease at low consumption levels. *Indeed, the net number of deaths from coronary heart disease attributable to alcohol is negative; that is, more deaths are prevented than caused by alcohol.* However, this is small comfort to the families of those who die as a result of their misuse of alcohol.

For causes of disease and death where a psychoactive substance is associated with both beneficial and adverse effects, we do not subtract the number of cases prevented by alcohol use from the total number attributed to alcohol. Instead, we present the gross figures in the cost tabulations. This is done to avoid contaminating estimates of the costs of alcohol, tobacco and illicit drugs with *partial* consideration of benefits. The question is, when you start looking at benefits, where do you stop? For causes of disease where the use of alcohol, tobacco or illicit drugs has both beneficial and adverse effects, the study presents the *number of cases* prevented by the use of a particular substance so that comparisons may be made to the results of studies which report net rather than gross costs (for example, Collins and Lapsley, 1991).

The economic cost estimates in this study do not necessarily indicate the amount of money and life years which could realistically be saved as a result of effective government and social policy and programming.

Intangible costs

Intangible costs are viewed as very significant even if they cannot be estimated in dollar terms. The major intangible costs of substance use are caused by death, pain, suffering and bereavement. While the study does not include a dollar value on the intangible aspects of life-years lost due to substance abuse, it does estimate the numbers of life-years lost for each major type of substance. This will permit the estimate of these costs in dollar terms, using the "willingness to pay" method of valuation.

Welfare costs

In dealing with the welfare costs attributable to drug abuse, care is taken to distinguish between the real resource costs of abuse (administrative costs for substance abuse-related welfare cases) and costs which are simply transfer payments. The welfare costs involved relate to the payments borne by the state (such as invalid pensions and sickness benefits). It is particularly important to ensure that there is no double counting of costs or benefits. If a person previously in the workforce receives welfare benefits as a result of abuse- related sickness, it would be double counting to also include in the estimate of external costs the productivity loss. Thus, the only welfare costs included in this study are administrative costs.

Non-workforce death and illness

This study assumes that people of working age not in the workforce (that is, employed or seeking employment) are providing non-market services to the rest of the community. This implies that the sickness or death of such people will involve withdrawal of others from the workforce to maintain the supply of non-market services. For example, the death of a non-working mother of school-age children means those children must be looked after by someone else, who in turn becomes unavailable for employment. The productive value lost due to the death or illness of working-age people not in the workforce is estimated from Statistics Canada figures for the value of houseworkers of similar age and gender.

Research, education and law enforcement costs

Some costs which are clearly attributable to substance use result from public decisions to reduce abuse rather than from the direct effects of substance use. Costs in this category include research expenditures, public education campaigns, and law enforcement programs. These costs are discretionary in the sense that governments could choose not to incur them. Presumably such reduced expenditures would lead to higher direct costs of substance use, but these expenditures are not themselves direct costs. In this study, these costs are included, but categorized as "policy costs". In this way, costs are identified as being incurred in relation to substance use, but are not classified as unavoidable costs of use.

Estimation of avoidable costs

The economic cost estimates in this study do not necessarily indicate the amount of money and life years which could realistically be saved as a result of effective government and social policy and programming. The alternative scenario in this study is one in which there are no problems associated with the use of psychoactive substances. This situation is hypothetical and generally not attainable under any circumstances. The estimated costs include both avoidable and unavoidable costs. Even if completely effective policies could be found with no appreciable costs for enforcement, treatment and prevention programming, implementation would not be instantaneous and there would still be lingering adverse consequences from past use of psychoactive substances.

Death and illness associated with substance abuse

Alcohol

It is estimated that 6,701 Canadians lost their lives as a result of alcohol consumption in 1992. The largest number of alcohol-related deaths stem from impaired driving accidents. It is estimated that 1,021 Canadian men and 456 women died in motor vehicle accidents as the result of drinking. Alcoholic liver cirrhosis accounted for 960 deaths and there were 908 alcohol-related suicides. Many of these deaths involved relatively young persons. Due to the high incidence of alcohol-related accidental deaths and suicides, the number of potential years of life lost is relatively high at 186,257 (134,495 years for men and 51,762 for women). This represents 27.8 years for each alcohol-related death. Motor vehicle deaths represent 22% of all alcohol-related deaths and 33% of potential years of life lost— an indication of the relatively young age of alcohol-related traffic fatalities.

With regard to alcohol-related morbidity (illness), it is estimated that there were 86,076 hospitalizations in 1992 (56,474 men and 29,602 women). These people spent a total of 1,149,106 days in hospital (755,205 for men and 393,902 for women). The greatest number of alcohol-related hospitalizations resulted from accidental falls (16,901), alcohol dependence syndrome (14,316) and motor vehicle accidents (11,154). The greatest number of hospital days were for accidental falls (308,224 days). Thus, accidental falls accounted for 6% of deaths, 20% of hospitalizations and 27% of days spent in hospital as a result of alcohol. In contrast, motor vehicle accidents associated with alcohol accounted for 22% of deaths, but only 13% of hospitalizations and 12% of days in hospital.

Tobacco

The total number of tobacco-related deaths in Canada is estimated to be 33,498 in 1992. The largest number of tobacco-related deaths (11,704) stem from lung cancer, representing 35% of all such deaths. Tobacco-related ischaemic heart disease accounts for 6,762 deaths and chronic obstructive pulmonary disease (COPD) accounts for 5,816 deaths. More than two-thirds (69%) of those who die from tobacco-related causes in Canada are men.

There were 208,095 hospitalizations as a result of tobacco use in Canada in 1992. The largest number was for ischaemic heart disease (37,648 hospitalizations for men and 14,363 for women). There were more than three million hospital days (3,024,265) resulting from tobacco-related causes. The largest contributors to the number of tobacco- related hospital days were COPD (630,282 days or 21% of the total due to tobacco), stroke (570,289 days or 19%), ischaemic heart disease (450,795 days or 15%) and lung cancer (423,239 days or 14%).

Illicit drugs

Mortality resulting from illicit drug use may be relatively infrequent compared with alcohol and tobacco-related deaths, but illicit drug death tends to involve younger victims.

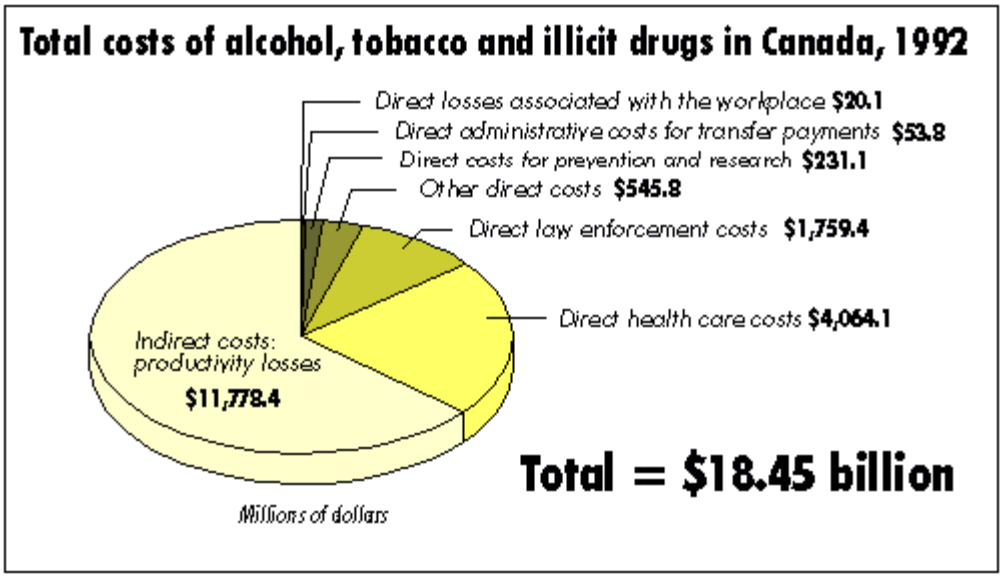
The total number of illicit drug-related deaths in Canada is estimated to be 732 in 1992. The vast majority (88%) of these deaths involve males. Suicide accounts for 42% of illicit drug-related deaths, while opiate poisoning and cocaine poisoning account for 14% and 9%, respectively. AIDS acquired through the use of illicit drugs accounts for 61 deaths (8% of all illicit drug-related deaths). Mortality resulting from illicit drug use may be relatively infrequent compared with alcohol and tobacco-related deaths, but illicit drug death tends to involve younger victims. The 732 illicit drug-related deaths resulted in 31,147 potential years of life lost, or 42.6 years for each death.

There were 7,095 hospitalizations and 58,571 days spent in hospital as a result of illicit drug use in 1992. Drug psychosis (1,207 or 17%), assaults (1,184 or 17%) and cocaine dependence (1,151 or 16%) account for about one-half of all illicit drug-related hospitalizations. The greatest proportion of hospital days due to illicit drugs is for drug psychosis (13,183 days or 22%), cocaine dependence (9,044 days or 15%) and drug- related assault (8,508 days or 14%).

Overview of the economic costs of substance abuse

It is estimated that substance abuse cost more than $18.45 billion in Canada in 1992. This represents $649 per capita, or about 2.67% of the total Gross Domestic Product.

- Alcohol accounts for more than $7.5 billion in costs, or $265 per capita. This represents 40.8% of the total costs of substance abuse. The largest economic costs of alcohol are $4.1 billion for lost productivity due to illness and premature death, $1.36 billion for law enforcement and $1.3 billion in direct health care costs.
- Tobacco accounts for $9.56 billion in costs, or $336 per capita. This is more than half (51.8%) of the total substance abuse costs. Lost productivity due to illness and premature death accounts for more than $6.8 billion of these costs and direct health care costs due to smoking account for $2.67 billion in costs.
- The economic costs of illicit drugs are estimated at $1.37 billion, or $48 per capita. The largest cost (approximately $823 million) is lost productivity due to illness and premature death, and a substantial portion of the costs ($400 million) are for law enforcement. Direct health care costs due to illicit drugs are estimated at $88 million.

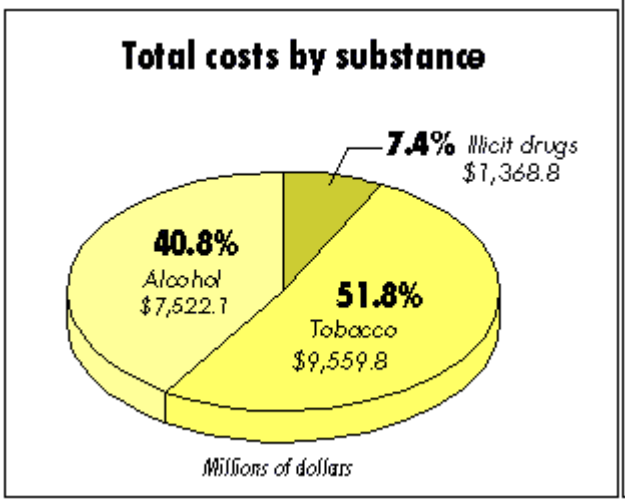


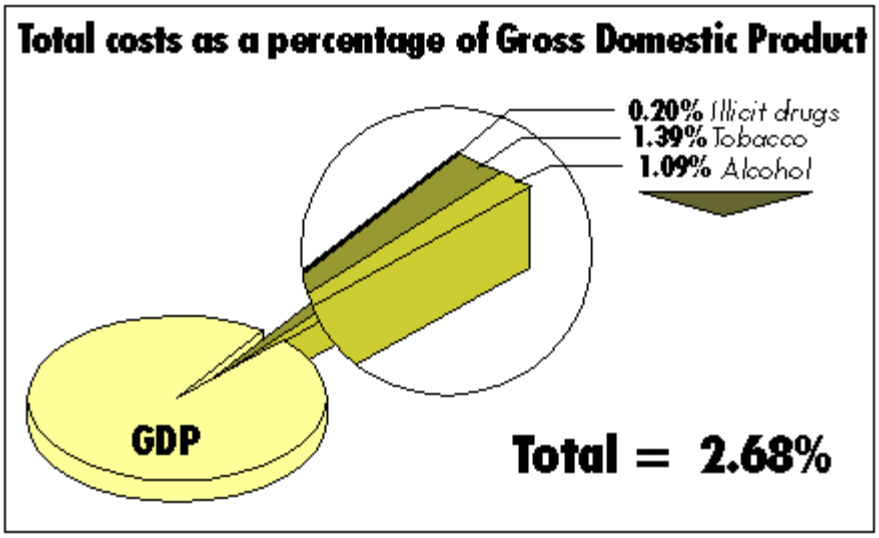
The costs of alcohol, tobacco and illicit drugs in Canada, 1992

Millions of dollars

	Alcohol	Tobacco	Illicit drugs	Total ATD
1. Direct health care costs: total	**$1,300.6**	**$2,675.5**	**$88.0**	**$4,064.1**
---1.1 morbidity-general hospitals	666.0	1,752.9	34.0	2,452.9
-------morbidity-psychiatric hospitals	29.0	--	4.3	33.3
---1.2 co-morbidity	72.0	--	4.7	76.7
---1.3 ambulance services	21.8	57.2	1.1	80.1
---1.4 residential care	180.9	--	20.9	201.8
---1.5 non-residential treatment	82.1	--	7.9	90.0
---1.6 ambulatory care: physician fees	127.4	339.6	8.0	475.0
---1.7 prescription drugs	95.5	457.3	5.8	558.5
---1.8 other health care costs	26.0	68.4	1.3	95.8
2. Direct losses associated with the workplace	**14.2**	**0.4**	**5.5**	**20.1**
---2.1 EAP and health promotion programs	14.2	0.4	3.5	18.1
---2.2 drug testing in the workplace	N/A	--	2.0	2.0
3. Direct administrative costs for transfer payments	**52.3**	**--**	**1.5**	**53.8**
---3.1 social welfare and other programs	3.6	--	N/A	3.6
---3.2 workers' compensation	48.7	--	1.5	50.2
---3.3 other administrative costs	N/A	N/A	N/A	N/A
4. Direct costs for prevention and research	**141.4**	**48.0**	**41.9**	**231.1**

---4.1 research	21.6	34.6	5.0	61.1
---4.2 prevention programs	118.9	13.4	36.7	168.9
---4.3 training costs for physicians and nurses	0.9	N/A	0.2	1.1
---4.4 averting behaviour costs	N/A	N/A	N/A	N/A
5. Direct law enforcement costs	**1,359.1**	**--**	**400.3**	**1,759.4**
---5.1 police	665.4	N/A	208.3	873.7
---5.2 courts	304.4	N/A	59.2	363.6
---5.3 corrections (including probation)	389.3	N/A	123.8	513.1
---5.4 customs and excise	N/A	N/A	9.0	9.0
6. Other direct costs	**518.0**	**17.1**	**10.7**	**545.8**
---6.1 fire damage	35.2	17.1	N/A	52.3
---6.2 traffic accident damage	482.8	--	10.7	493.5
7. Indirect costs: productivity losses	**4,136.5**	**6,818.8**	**823.1**	**11,778.4**
---7.1 productivity losses due to morbidity	1,397.7	84.5	275.7	1,757.9
---7.2 productivity losses due to mortality	2,738.8	6,734.3	547.4	10,020.5
---7.3 productivity losses due to crime	--	--	N/A	N/A
Total	**7,522.1**	**9,559.8**	**1,371.0**	**18,452.9**
Total as % of GDP	*1.09%*	*1.39%*	*0.20%*	*2.67%*
Total per capita	*$265*	*$336*	*$48*	*$649*
Total as % of all substance-related costs	*40.8%*	*51.8%*	*7.4%*	*100.0%*





Discussion of national results

Comparisons with other studies

There is now a significant body of epidemiological research and information on relative risk that was not available for earlier Canadian studies.

The estimated costs of alcohol in this study ($7.5 billion) are similar to most other studies as a percentage of Gross Domestic Product (1.1%), but are somewhat lower than a previous Canadian study by Adrian et al. (1988) which found the costs of alcohol to be $11.8 billion (2.7% of GDP) in 1984. There are several possible reasons for this difference. As noted earlier, this investigation is based on a conservative operating principle and includes only those costs which can be reliably linked to the use of psychoactive substances. Where alternative sources of data disagree, the lowest figures are generally used. In addition, there are differences in methodology. Unlike the previous study, this report uses a cost-of-illness approach.

Perhaps most importantly, there is now a significant body of epidemiological research and information on relative risk that was not available for earlier Canadian studies. These new data permit us to estimate mortality with much greater precision than was previously possible. For example, previous Canadian studies assumed that 10% of all cancer deaths were due to alcohol; this study takes specific diagnosis, age and gender into account and finds that only 2.1% of cancer mortality is due to alcohol.

Similarly, this study arrives at a lower estimation of tobacco-related mortality than some previous research. For example, the estimated number of tobacco deaths is approximately 25% lower than the 41,400 deaths due to tobacco for 1991 estimated by Makomaski-Illing and Kaiserman (1995). Some of the discrepancy results from the use of different risk ratios for lung cancer in male smokers. The previous study used a risk ratio of 22 based on one of the largest studies available (US Department of Health and Human Services, 1989). The risk ratio of 13 for male lung cancer used in this study was derived by pooling estimates from 10 studies *in addition to* the study cited by Makomaski-Illing and Kaiserman.

This study presents costs of illicit drugs that are similar to other studies as a percentage of Gross Domestic Product (0.2%), with two notable exceptions. First, US studies (for example, Rice et al., 1990) have generally found illicit drug costs to be considerably higher, probably because these costs are, in fact, higher in the US where illicit drug use is much more prevalent. Second, the results of this study are considerably lower than in the only previous national estimate of drug-related costs. As with the alcohol estimates, it is likely these discrepancies stem from methodological differences and from more precise calculations based on new epidemiological data.

"Policy" costs

Policy costs are those which are incurred as a conscious decision by policy makers, as opposed to those costs imposed on the treatment system and on industry as a result of substance-related illness and death. Policy costs include virtually all of the costs for prevention, research and law enforcement. It is estimated that these costs are approximately $1.5 billion for alcohol (20% of the total economic costs due to alcohol) and $442 million for illicit drugs (32% of the total costs). By contrast, policy costs in 1992 were negligible for tobacco, representing less than 1% of the total economic costs due to tobacco. This means that policy costs—including law enforcement, prevention and research—were lowest for the substance which inflicts the greatest cost on society.

"Avoidable" costs

Since treatment, law enforcement and productivity costs constitute the bulk of the costs associated with alcohol, it is reasonable to conclude that the majority of alcohol-related costs could be avoided.

Avoidable costs are those which would not have been incurred if there had been no problems associated with the use of alcohol, tobacco or illicit drugs in Canada in 1992 (the counterfactual scenario). As noted earlier, even if there had been a sudden end to substance abuse problems in that year, there would still have been costs due to the cumulative and/or lagged impact of prior substance abuse, in addition to persistent policy costs. There are insufficient data to make a precise and detailed calculation of avoidable costs, but several observations can be made.

With regard to alcohol, it would appear that most of the economic costs are avoidable. Approximately half of deaths and hospitalizations result from acute causes such as motor vehicle and other accidents, alcohol toxicity, suicide, and assault. Most of these deaths involve relatively young people, so that the number of potential years of life lost and productivity losses due to premature death are disproportionately high. As well, some of the deaths and hospitalizations due to alcohol-related chronic conditions would have been avoided if alcohol misuse had ceased. This means that most of the treatment costs and lost productivity due to premature death are avoidable. Most of the law enforcement costs related to alcohol use are also avoidable. Since treatment, law enforcement and pro- ductivity costs constitute the bulk of the costs associated with alcohol, it is reasonable to conclude that the majority of alcohol-related costs could be avoided.

Although a substantial portion of the costs associated with tobacco use are avoidable, ex- smokers still have a considerably elevated risk for several disorders,

most notably lung cancer, compared with people who never smoked. This means that if every Canadian smoker were to suddenly quit smoking, levels of lung cancer and other tobacco-related disorders would decrease substantially, but a considerable portion of tobacco-related death and illness would persist.

Illicit drug costs, on the other hand, are largely avoidable. The vast majority of illicit drug- related deaths are due to suicide, poisoning and assault. The relatively small proportion of mortality due to drug-related AIDS (less than 10% of total illicit drug deaths) would persist, but most illicit drug mortality would cease if the misuse of illicit drugs ended. It is not clear if law enforcement costs would diminish significantly if there were no illicit drug misuse because the law is directed at all use, not just use which leads to a net social cost. Nonetheless, the majority of costs associated with illicit drug use are the productivity losses due to premature death, so we conclude that most illicit drug costs could be avoided.

Sensitivity analyses

The results of cost studies can vary according to the methods used to estimate cost components. Sensitivity analyses are done to examine the extent to which the use of a particular method changes the findings. This study looked at three methodological considerations:

- The weighting of hospitalization costs according to diagnosis
- The use of alternative discount rates to estimate lost productivity
- The use of alternative ways to measure prevalence of abuse.

Hospitalization costs

Previous studies have generally estimated hospitalization costs using a mean daily rate for time spent in hospital. This ignores the fact that some disorders involve higher (or lower) costs. For example, the daily hospital cost for treating an AIDS patient is reported to be considerably higher than for other patients. At issue is whether the use of a mean daily cost biases the results in one direction or the other, leading to estimates that are too high or too low. A special analysis was conducted for this study in which hospitalization costs were calculated according to "Resource Intensity Weights" (RIWs) developed by the Canadian Institute on Health Information. This analysis showed that hospitalization costs do vary according to diagnosis, but not considerably. There are undoubtedly many substance-related conditions which involve above-average costs, but by the same token, there are also many which are below the overall average. The sensitivity analysis confirmed that the use of mean daily costs is a reasonable approximation of hospitalization costs.

Alternative discount rates

Estimates of the value of lost productivity due to premature death are strongly influenced by the way we compute the present value of future earnings (the discount rate). The higher the discount rate chosen, the lower the present value of lifetime earnings. In this study, the estimated productivity losses due to premature death are presented using discount rates of 4%, 5%, 6% and 10%. The costs reported are based on a 6% discount rate. Assuming a 1% annual increase in productivity, this represents an effective discount rate of 5%.

The total estimated value of lifetime earnings of people who die prematurely from substance-related conditions ranges from $7.17 billion using a discount rate of 10% to $12.35 billion using a discount rate of 4%. The estimated productivity losses due to alcohol are $1.82 billion with a 10% discount rate and $3.57 billion with a 4% discount rate. The range for tobacco is from $5.0 billion to $8.06 billion, and the range for illicit drug productivity costs is from $354 million to $724 million. The choice of discount rate has a considerable impact on estimated productivity losses, and consequently on the total estimated costs of substance abuse.

Alternative measures

A sensitivity analysis was conducted to assess the influence of three different measures of alcohol consumption: quantity-frequency (QF), graduated frequency (GF), and weekly drinking (WD). QF measures average consumption based on questions about the frequency of drinking occasions and the usual or average number of drinks on each occasion. A QF survey requires only two questions, but in giving averaged responses, survey subjects tend to disregard heavy (and harmful) drinking events.

The GF measure starts with a question about the highest number of drinks on any occasion during the past year. It then asks a series of questions to determine how often the respondent consumed specific amounts, starting with the highest quantity and gradually working down to one or two drinks.

WD patterns are usually measured by asking the number of drinks an individual had eight days before the survey, and then continuing with each day of the week until the day before the survey. Using this measure tends to over-represent abstainers.

These consumption measures yield different estimates of the economic costs of alcohol. Hospitalization days, drug costs, physicians' fees and productivity losses due to illness or premature death are all highest using the GF measure and lowest using the WD measure, with estimates falling in between when using the QF measure. The total estimated costs of alcohol misuse is $7.734 billion using the GF measure, $7.522 billion using the QF measure, and $7.225 billion using the WD measure.

The sensitivity analysis indicated that the method of measuring alcohol consumption has a major influence on prevalence estimates for hazardous and harmful drinking. The influence on mortality and other derived measures is less dramatic. Since almost all epidemiological studies use QF measures to assess alcohol use, it was decided to base cost estimates in this study on QF measures. We believe the GF measure reflects real drinking patterns more accurately, but the use of GF figures would have biased the results since our attributable fractions (the degree to which alcohol is responsible for a given condition) are based on epidemiological studies. We hope that future epidemiological studies will use methodologies that yield a more accurate picture of consumption patterns and their influence on harm and costs.

Range of estimated costs

The results of the sensitivity analyses indicate the following ranges of estimated economic costs of alcohol, tobacco and illicit drugs. For alcohol, the highest estimate would involve not using Resource Intensity Weights, discounting future income at 4% and using a graduated frequency measure for alcohol prevalence. The lowest

estimate would result from using Resource Intensity Weights, discounting future income at 10% and using a weekly drinking measure for alcohol prevalence. Under these extreme assumptions, the estimated costs of alcohol range from $6.3 billion to $8.6 billion. This compares with our "best" estimate of $ 7.5 billion.

For tobacco, the highest estimate would involve using Resource Intensity Weights and discounting future income at 4%. The lowest estimate would result from not using Resource Intensity Weights and discounting future income at 10%. Under these extreme assumptions, the estimated costs of tobacco range from $7.8 billion to $11.1 billion. Our estimate of $ 9.6 billion lies between these estimates.

For illicit drugs, the highest estimate would involve using Resource Intensity Weights and discounting future income at 4%, while the lowest estimate would result from not using Resource Intensity Weights and discounting future income at 10%. Under these extreme assumptions, the estimated costs of illicit drugs range from $1.2 billion to $1.5 billion. Our estimate of $1.37 billion falls near the middle of these two estimates.

Range of costs under extreme assumptions, based on sensitivity analyses of alternative prevalence estimates, discount rates and Resource Intensity Weights for different diagnoses

	Billions of dollars
Alcohol	**$6.3 - $8.6**
Tobacco	**$7.8 - $11.1**
Illicit drugs	**$1.2 - $1.5**
Total	**$15.3 - $21.3**

Provincial estimates

The economic costs of substance abuse have also been estimated for each of the 10 Canadian provinces. The estimates of death and illness due to alcohol, tobacco and drugs are based on provincial data regarding prevalence of use and the number of deaths and hospitalizations. Where available, province-specific data on the various cost components have been used. Where not available, national per capita averages are used.

Differences in mortality and morbidity

Somewhat surprisingly, illicit drug mortality in Ontario is close to the national average despite the concentration of drug users in Metropolitan Toronto.

The overall rate of mortality due to substance abuse is highest in Prince Edward Island (180 deaths per 100,000 population) and in Nova Scotia (180 per 100,000) and lowest in Alberta (117 per 100,000 population) and Newfoundland (128 per 100,000). These provincial differences in overall substance-related mortality are largely due to tobacco- related mortality, which is highest in Nova Scotia (154 deaths

per 100,000) and Prince Edward Island (153 per 100,000). Alberta, on the other hand, has the lowest rate of mortality due to smoking (89 deaths per 100,000 population). Ontario (110 per 100,000), Newfoundland (112 per 100,000) and Saskatchewan (116 per 100,000) also have relatively low tobacco mortality rates, while Québec (132 per 100,000) and New Brunswick (131 per 100,000) are above the national average.

Provincial differences in years of potential life lost and hospitalizations due to tobacco use reflect mortality patterns, with the highest per-capita rates in PEI and Nova Scotia and lowest in Alberta. However, the highest rates of hospital days due to tobacco-related illnesses are in New Brunswick (13,493 days per 100,000 population) and in Québec (13,225 per 100,000).

The lowest mortality rate for alcohol-related disorders is in Newfoundland (15 deaths per 100,000 population). Among the other provinces, there is relatively little provincial variation in alcohol-related mortality rates, which range from 23 per 100,000 population in Ontario, Québec and New Brunswick to 27 per 100,000 in British Columbia. Newfoundland and Ontario have the lowest rate of potential years of life lost, while Alberta has the highest. The fewest hospitalizations and hospital days for alcohol-related problems are in New Brunswick. Saskatchewan has the highest rate of hospitalizations for alcohol-related disorders while British Columbia has the most number of days per capita spent in hospital for alcohol-related problems.

Illicit drug-related conditions contribute a great deal less than tobacco or alcohol to overall mortality. Death rates due to illicit drugs vary considerably from province to province. By far, the greatest number of deaths per capita occur in British Columbia (4.7 per 100,000 population) and the lowest rate is in Newfoundland (1.0 per l00,000). Alberta (3.1) and Québec (2.8) have illicit drug mortality rates which are above the national average. There is relatively little variation among the other provinces, which range from 1.5 in New Brunswick to 2.0 in Saskatchewan and Ontario. Somewhat surprisingly, illicit drug mortality in Ontario is close to the national average despite the concentration of drug users in metropolitan Toronto. Provincial differences in potential years of life lost, hospitalizations and hospital days generally follow mortality rates. However, Newfoundland has a relatively high rate of hospital days related to illicit drug use despite relatively low mortality and hospitalization rates.

Differences in economic costs

The report shows that the per-capita costs of alcohol misuse are highest in Alberta ($285 per capita). The lowest per-capita costs of alcohol are in Newfoundland ($199). Among the other provinces, per-capita alcohol costs range from $243 in Québec to $283 in Prince Edward Island.

Nova Scotia incurs the highest costs related to tobacco ($398), followed by Prince Edward Island ($361), New Brunswick ($354) and Ontario ($346). The lowest per-capita costs attributed to tobacco are in Alberta ($277), Saskatchewan ($281) and Newfoundland ($294).

The per-capita costs of illicit drugs range from $31 in Newfoundland to $60 in British Columbia. It is estimated that illicit drugs cost the British Columbia economy $207

million in 1992. Relatively high economic costs are also attributed to illicit drugs in Alberta ($135 million or $51 per capita), Ontario ($507 million or $48 per capita), Québec ($333 million or $47 per capita) and Prince Edward Island ($4.7 million or $36 per capita).

The following table shows costs of substance abuse in the provinces in terms of Gross Domestic Product (GDP) and as a per-capita expense. Per-capita costs are highest in Nova Scotia ($699) and Prince Edward Island ($681) and lowest in Newfoundland ($524). Relative to GDP, substance abuse costs the most in Prince Edward Island ($88.7 million or 4.0% of GDP) and the least in Alberta ($1.6 billion or 2.2% of GDP). The costs of substance abuse in the other provinces range from 2.5% of GDP in Ontario to 3.6% in Nova Scotia.

The total costs of substance abuse in Canadian provinces, 1992

Province:	**BC**	**AB**	**SK**	**MB**	**ON**	**QC**	**NB**	**NS**	**PE**	**NF**
Population (1000s)	3,451.3	2,632.4	1,004.5	1,113.1	10,609.8	7,150.7	749.1	920.8	130.3	581.1
GDP ($millions)	86,337	73,720	21,001	23,631	280,509	156,761	13,967	17,800	2,196	9,182
Alcohol total costs	**938,863**	**749,330**	**265,977**	**283,542**	**2,861,926**	**1,728,517**	**178,645**	**240,092**	**36,928**	**115,333**
Total as % of GDP	1.09	1.02	1.27	1.20	1.02	1.11	1.28	1.35	1.67	1.26
Total per capita	272	285	265	255	270	243	239	261	283	199
Total as % of all sub. abuse	41.6	46.5	45.5	41.6	40.5	39.0	38.1	37.3	41.6	37.9
Tobacco total costs	**1,110,665**	**728,589**	**281,842**	**354,008**	**3,673,860**	**2,366,748**	**265,551**	**367,016**	**47,058**	**170,976**
Total as % of GDP	1.29	0.99	1.34	1.50	1.31	1.51	1.90	2.06	2.14	1.86
Total per capita	322	277	281	318	346	331	354	398	361	294

Total as % of all sub. abuse	49.2	45.2	48.3	51.9	52.3	53.4	56.6	57.1	53.1	56.1
Illicit drugs total costs	**207,534**	**135,258**	**36,128**	**45,132**	**507,518**	**334,299**	**25,256**	**36,156**	**4,686**	**18,239**
Total as % of GDP	0.24	0.18	0.17	0.19	0.18	0.21	0.18	0.20	0.21	0.20
Total per capita	60	51	36	40	48	47	34	39	36	31
Total as % of all sub. abuse	9.2	8.4	6.2	6.6	7.2	7.5	5.4	5.6	5.3	6.0
Total substance abuse total costs	**2,257,062**	**1,613,176**	**583,946**	**682,682**	**7,027,101**	**4,429,546**	**469,451**	**643,265**	**88,672**	**304,548**
Total as % of GDP	2.61	2.19	2.78	2.89	2.51	2.83	3.36	3.61	4.03	3.32
Total per capita	654	613	581	613	662	619	627	698	681	524

Summary and conclusions

A considerable toll

There were 40,930 deaths attributable to substance abuse in Canada in 1992. Tobacco accounted for 33,498 of these deaths, alcohol 6,701 and illicit drugs 732. This represents 21% of total mortality for that year. Smoking-related deaths alone account for 17% of total mortality in 1992. Potential years of life lost due to substance abuse constitute 23% of the total years of life lost due to any cause–16% due to tobacco, 6% due to alcohol and 1% due to illicit drug use. The number of hospitalizations due to substance abuse constitutes 8% of total hospitalizations and 10% of the total days spent in hospitals for any cause.

It is estimated that substance abuse cost $18.45 billion in Canada in 1992. This represents $649 per capita, or about 2.7% of the total Gross Domestic Product. Alcohol accounted for more than $7.5 billion in costs, representing $265 per capita. Tobacco accounted for more than $9.6 billion in costs, or $340 per capita. The economic costs of illicit drugs are estimated at $1.37 billion, or $48 per person.

Better estimates

In this study, estimates of death and illness attributable to substance abuse are lower than in previous studies. This is largely due to the availability of much more precise information on the attributable fractions of specific disease categories (vs. broad categories), with age, gender and province all taken into account. With regard to tobacco, the lower estimation of illness and death is partly due to the use of pooled estimates from several studies rather than one study alone.

Deaths averted

It was found that alcohol prevented 7,401 deaths in 1992, largely because of the beneficial impact of alcohol use on ischaemic heart disease and stroke. However, years of potential life lost due to alcohol (186,257) are much greater than years of potential life saved by its beneficial effects (88,656). Furthermore, the number of hospitalizations caused by alcohol (86,076) far outnumbers the number prevented by alcohol use (45,414).

Accidental death

Accidental death contributes a much greater share of overall alcohol-related morbidity and mortality than shown in previous studies. This is a result of chronic disease contributing a lower proportion of overall alcohol-related illness and death than in previous studies. For example, previous estimates attributed 10% of all cancer deaths to alcohol, but more detailed calculations indicate that only 2.1% of cancer mortality is due to alcohol.

Avoidable costs

In 1992, policy costs—law enforcement, prevention and research—were lowest for tobacco, the psychoactive substance which inflicts the greatest cost on society. It is concluded that most of the economic costs associated with alcohol and illicit drugs are avoidable, but this is less true for tobacco.

Costs vary

Finally, it is concluded that the costs of substance abuse vary considerably from province to province in Canada.

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