Counting the cost: estimates of the social costs of drug abuse in Australia in 1998-9

Monograph Series No. 49

National Drug Strategy

Counting the cost: estimates of the social costs of drug abuse in Australia in 1998-9

by
David J. Collins
Macquarie University
Sydney

and

Helen M. Lapsley
University of New South Wales
Sydney

ISBN 0 642 82181 X

Publication approval number: 3179

Publications Production Unit (Governance and Business Strategy Branch)
Commonwealth Department of Health and Ageing
Canberra

Contents

List of tables

Executive summary

This report is the third study by the present authors of the social costs of drug abuse in Australia. It presents estimates of the costs of alcohol, tobacco and illicit drugs for the most recent year for which all relevant data are available, the financial year 1998-9. The results of this study are not directly comparable with the previous estimates for several reasons, which are discussed in the body of the paper.

The production of this report was preceded by an extensive scoping study which permitted the identification of new data and the further development of existing data. The revised aetiological fractions which again form the basis of the health cost calculations include, for the first time, estimates of the impact of involuntary smoking. Other newly available data have enabled a broader scope of estimation, including the costs of absenteeism, pharmaceuticals, ambulances, fires and crime. The costs presented here are net costs and, consistent with previous studies, a conservative approach to estimation was adopted. In general, lower cost alternatives were always selected where appropriate alternatives existed.

The overall results are summarised in the following two tables. The first table provides a summary of the overall results of this study.

The social costs of drug use, 1998-9

	Alcohol $m	Tobacco $m	Illicit Drugs $m	All Drugs $m
Tangible	5,541.3	7,586.7	5,107.0	18,340.8
Intangible	2,019.0	13,476.3	968.8	16,099.0
Total	**7,560.3**	**21,063.0**	**6,075.8**	**34,439.8**
Proportion of total	**22.0%**	**61.2%**	**17.6%**	**100.0%**

Source: Table 27

Note that in the above table the sum of the individual drugs estimates may not add up to the "All Drugs" total as a result of the fact that some crime costs are jointly attributable to both alcohol and illicit drugs. In addition, an adjustment has been made in the "All Drugs" column for the interactive effects involved in the estimation of aetiological fractions for conditions attributable to more than one drug.

The second table presents estimates of selected individual categories of tangible drug abuse costs.

Selected tangible drug abuse costs, 1998-9

	Alcohol	Tobacco	Illicit Drugs	Alcohol and Illicit Drugs Combined	Total
	$m	$m	$m	$m	$m
Crime	1,235.3	–	2,500.4	582.3	4,318.0
Health (net)	225.0	1,094.9	59.2	–	1,379.1
Production in the workplace	1,949.9	2,519.5	991.2	–	5,460.7
Production in the home	402.6	6,880.0	344.8	–	7,627.5
Road accidents	1,875.5	–	425.4	–	2,300.9
Fires	–	52.1	–	–	52.1

Source: various tables in Section 6.

The costs presented in this paper, although not directly comparable with previous estimates, indicate higher tobacco costs, as a result of revision of the aetiological fractions, identification of a wider range of costs, and the ageing of the cohort of smokers being treated. The costs of alcohol misuse are still high, although the protective effects of moderate alcohol consumption are quantified and the resulting cost savings calculated. The costs of alcohol-attributable crime are calculated for the first time. The higher estimates of the costs of illicit drugs reflect the increasing availability of data, especially on the costs of crime.

Some of the costs of involuntary smoking have been identified and it is apparent that a high proportion of these costs are imposed on the young.

Disaggregated results, which are necessary for policy purposes, are presented to indicate:

- Tangible/intangible costs;
- Avoidable/non-avoidable costs;
- Budgetary impact; and
- Cost incidence.

Total drug abuse costs are greater than avoidable costs, because a significant proportion of abuse costs are not preventable. Some costs will continue to be borne because of previous events or previously contracted illnesses, while other costs will continue to be incurred because some level of drug abuse is likely to remain a feature of our society for the foreseeable future.

The potential cost savings as a result of effective public policies are estimated for tobacco and alcohol, but it did not prove possible to make such estimates for illicit drugs. These cost estimates provide baseline data for the evaluation of drug policies and programs.

Acknowledgments

The people who generously assisted us with their time, knowledge, and expertise, and to whom we are most grateful, include, in alphabetical order:

Name	Organisation
Johnson Amoako	Bureau of Transport Economics
Chris Brooks	Australian Transport Safety Bureau
Brian Easton	Economic consultant, New Zealand
Sue Gordon	Department of Health and Ageing
John Goss	Australian Institute of Health and Welfare
Phillipa Hair	Macquarie University
Tony Hyne	Australian Institute of Health and Welfare
Katherine Kirk	Queensland Fire and Rescue Service
Lyn March	Royal North Shore Hospital
Ross Saunders	Department Of Health and Ageing
Alison Sewell	Department of Health and Ageing
Amber Summerill	Department Of Health and Ageing
Araleen Taylor	Health Insurance Commission

Significant contributions to the methodological analyses and data development have been made by

- Professor John Pollard of Macquarie University, whose demographic estimates are presented as Appendix A;
- Dr James Codde of the Western Australian Department of Health, whose estimates of drug-attributable cases are presented as Appendix B;
- Paul Williams of the Australian Institute of Criminology, whose estimates (based on DUCO) of drug-caused crime are presented as Appendix C; and
- Dr Toni Makkai and Kiah McGregor of the Australian Institute of Criminology, whose estimates (based on DUMA) of drug-caused crime are presented as Appendix D.

We continue to draw on the epidemiological work of Holman, Armstrong *et al*, English, Holman *et al* and now Ridolfo and Stevenson, without all of whose painstaking calculation of aetiological fractions it would not be possible to undertake this study.

We are grateful to the reviewers for comments received on an earlier draft of this report. All suggestions were carefully considered and, where possible, have been incorporated.

We are greatly indebted to all who assisted us. If errors and omissions remain, despite all the information and assistance provided, they are entirely our responsibility

1. Introduction

This is the third in a series of estimates of the social costs of drug abuse in Australia. The first (Collins and Lapsley 1991) presented drug abuse cost estimates for the calendar year 1988 and the second (Collins and Lapsley, 1996) for the calendar year 1992. In both cases the calendar year was chosen as the basis for study rather than a financial year because the fundamental epidemiological data were available only on a calendar year basis. Since this is no longer the case, the present study produces estimates for 1998-9, the most recent financial year for which all the necessary data are available.

In Collins and Lapsley (1996) the results of Collins and Lapsley (1991) were recalculated on the same basis so that the two sets of results for the two years (1988 and 1992) were comparable. It has not, however, proved possible to recalculate fully these earlier results on a basis comparable with the present study. The main reason for this is that new and relevant data which have become available for recent years remain unavailable for the two earlier years. For example, a great deal of data relevant to the estimation of the costs of drug-attributable crime and of involuntary smoking have recently become available. As a consequence, it is not possible directly to compare the results for the three study years. The results of the present study stand on their own.

This study uses the demographic approach, also used in the earlier studies, and again estimates the net costs of abuse. Since the previous study there have become available significant new data and enhancements of previously available data, enabling estimations to be made for the first time of the drug-attributable costs of absenteeism, fires, pharmaceuticals, ambulances, and crime. In addition to new primary data, the calculations have been facilitated through the use of the *Report on Government Services* now produced each year by the Productivity Commission for the Steering Committee for the Review of Commonwealth/State Service Provision. As in previous studies, where alternative appropriate costs are available we consistently use the lower costs, so that all of our estimates remain conservative.

It has still proved impossible to estimate the costs of abusive consumption of prescribed pharmaceuticals.

The process of the estimation of the social costs of drug abuse has been significantly developed through participation in the international collaboration which has produced the *International Guidelines for Estimating the Costs of Substance Abuse*, by Eric Single, David Collins, Brian Easton, Henrick Harwood, Helen Lapsley and Alan Maynard, first published by the Canadian Centre on Substance Abuse in 1996. A revised and expanded further edition, with slightly different authorship, is being prepared for publication. These guidelines are intended to facilitate the development of valid and credible estimates of the economic costs of the abuse of alcohol, tobacco and illicit drugs, exploring definitional and methodological issues and data requirements. The symposia which have been held as a part of the guidelines revision have enabled the methodology used in the present study to be subjected to extensive review.

The methodology was also reviewed at World Bank meetings on the economics of tobacco control, which were part of a three year research project involving 40 economists from 13 countries, and resulted in the publication *of Tobacco Control in Developing Countries*, Jha, Prabhat and Chaloupka, Frank J (eds.) Oxford University Press, 2000. The chapter ‘ Estimating the Costs of Tobacco Use’ is authored by James Lightwood, David Collins, Helen Lapsley and Thomas Novotny.

The costs presented here are net costs and, consistent with previous studies, a conservative approach to estimation was adopted. In general, lower cost alternatives were always selected where appropriate alternatives existed.

The illicit drugs to which the costs estimates refer are:

- Cannabis, for example marijuana and hashish;
- Opiates, for example heroin;
- Stimulants, for example cocaine and amphetamines;
- Hallucinogens, for example LSD; and
- Anabolic steroids.

2. Epidemiological issues

The epidemiological background to economic studies

Since a high proportion of the social costs of drug abuse results from drug-attributable death or sickness, the evidence quantifying the causal links between drug abuse and its health consequences represents data fundamental to social cost estimation. In recent years Australian epidemiological researchers have provided a series of comprehensive studies quantifying these causal links (see Holman *et al*, 1991; English *et al*, 1995 ; and Ridolfo and Stevenson, 2001).

The strength of the causal link between abuse of a particular drug and its consequences for a particular health problem is represented by the aetiological fraction. "An aetiological fraction-also known as an attributable proportion or attributable risk-is a form of indirect quantification of morbidity and mortality due to a specified risk factor. In this case the risk factor is the consumption of tobacco, alcohol or an illicit drug" (Ridolfo and Stevenson, 2001, p. 2). Consider Table 1 below.

Table 1, Selected aetiological fractions for tobacco

Condition	Male Aged 35-39	Female Aged 35-39
Stroke	0.416	0.378
Pneumonia	0.180	0.159

This table, using data from Ridolfo and Stevenson (2001), indicates that 41.6% of all stroke deaths of Australian males in the age group 35 to 39 are causally associated with tobacco. Among Australian females in the same age group the percentage (37.8%) is slightly lower. Much lower proportions of pneumonia deaths are attributable to smoking (18.0% for males aged 35-39 and 15.9% for females). (For an explanation of how aetiological fractions are calculated see Ridolfo and Stevenson (2001, chapter 2)).

An aetiological fraction which is positive but less than one indicates that the particular medical condition has more than one cause. The above table, for example, indicates that smoking is not the only cause of strokes or pneumonia. Occasionally these fractions can be negative, indicating that the drug in question has a protective effect against the medical condition under study.

Calculation of the aetiological fraction requires two fundamental pieces of information – the relative risk (measuring the causal relationship between exposure to the risky drug and the condition being studied) and prevalence (measuring the proportion of the relevant population engaging in the risky activity).

Table 2 lists all the conditions which Ridolfo and Stevenson (2001) and their predecessors have concluded are causally linked to the abuse of alcohol, tobacco or illicit drugs.

Table 2, Conditions attributable to drug abuse, classified by drug

Alcohol	Tobacco	Illicit drugs
Oropharyngeal cancer	Oropharyngeal cancer	Opiate dependence
Oesophageal cancer	Oesophageal cancer	Opiate abuse
Liver cancer	Stomach cancer	Accidental opiate poisoning
Laryngeal cancer	Anal cancer	Antepartum haemorrhage due to opiates
Female breast cancer	Pancreatic cancer	Low birthweight due to opiates
Alcoholic psychosis	Laryngeal cancer	Cannabis dependence
Alcohol dependence/abuse	Lung cancer	Cannabis abuse
Alcoholic liver cirrhosis	Endometrial cancer	Amphetamine dependence
Road injuries	Cervical cancer	Amphetamine abuse
Epilepsy	Vulvar cancer	Cocaine dependence
Alcoholic poly-neuropathy	Penile cancer	Cocaine abuse
Hypertension	Bladder cancer	Accidental poison by psychostimulants
Ischaemic heart disease	Renal parenchymal cancer	Hallucinogen dependence
Alcoholic cardiomyopathy	Renal pelvic cancer	Hallucinogen abuse
Supraventricular cardiac dysrhythmias	Respiratory carcinoma in situ	Accidental poisoning by hallucinogens
Heart failure	Ischaemic heart disease	Antepartum haemorrhage due to cocaine
Stroke - haemorrhagic	Chronic obstructive pulmonary disease	Low birthweight due to cocaine
Stroke - ischaemic	Tobacco abuse	Hepatitis B
Oesophageal varices	Parkinson's disease	Hepatitis non A, and B
Gastro-oesophageal haemorrhage	Pulmonary circulation disease	AIDS
Alcoholic gastritis	Cardiac dysrhythmias	Infective endocarditis
Unspecified liver cirrhosis	Heart failure	Drug psychoses
Cholelithiasis	Stroke	Maternal drug dependence
Pancreatitis - acute	Atherosclerosis	Newborn drug toxicity
Pancreatitis - chronic	Pneumonia	Road injuries
Low birthweight	Peptic ulcer	Suicide
Psoriasis	Crohn's disease	
Alcoholic beverage & other EtOH poisoning	Ulcerative colitis	
Other ethanol and methanol poisoning	Ectopic pregnancy	
Fall injuries	Spontaneous abortion	
Fire injuries	Antepartum haemorrhage	
Drowning	Hypertension in pregnancy	
Aspiration	Low birthweight	
Occupational and machine injuries	Premature membrane rupture	
Suicide and self-inflicted injury	SIDS (and smoking during pregnancy)	
Assault	Fire injuries	
Child abuse	Asthma (under 15 years)	
	Lower respiratory illness (under 18 months)	
	SIDS (and post natal smoking)	
	Lung cancer (passive)	
	Ischaemic heart disease (passive)	

The Ridolfo and Stevenson study is fundamentally based upon the earlier work by Holman *et al* (1991) and English *et al* (1995). Rather than undertaking a full review of all relevant literature Ridolfo and Stevenson confined themselves solely to:

- reviewing relevant literature which has appeared since 1995, which may provide new information on relative risks; and
- revising prevalence of drug usage in the light of more up-to-date information.

Table 3 lists the conditions for which relative risk factors were revised or new risk factors were produced.

Table 3, Conditions for which aetiological fractions changed as a result of revised risk-ratios, or new fractions introduced

Alcohol	Tobacco	Illicit drugs
Female breast cancer	Cervical cancer	Road injuries
Stroke- ischaemic	Peptic ulcer	
Stroke- haemorrhagic	SIDS (and smoking during pregnancy)	
Road injuries	Lower respiratory illness (under 18 months) (new)	
Fall injuries	Asthma (under 15 years) (new)	
	Lung cancer (involuntary smoking) (new)	
	Ischaemic heart disease (involuntary smoking) (new)	

The next table gives conditions for which the aetiological fractions were revised in the light of new prevalence or other data.

Table 4, Conditions for which aetiological fractions were revised using updated prevalence or other data

Alcohol	Tobacco	Illicit drugs
Oropharyngeal cancer	Oropharyngeal cancer	AIDS
Oesophageal cancer	Oesophageal cancer	Antepartum haemorrhage
Liver cancer	Stomach cancer	Low birthweight
Laryngeal cancer	Anal cancer	
Hypertension	Pancreatic cancer	
Ischaemic heart disease	Laryngeal cancer	
Supraventricular cardiac dysrhythmias	Lung cancer	
Heart failure	Endometrial cancer	
Unspecified liver cirrhosis	Vulvar cancer	
Cholelithiasis	Penile cancer	
Low birthweight	Bladder cancer	
Psoriasis	Renal parenchymal cancer	
Suicide and self-inflicted injury	Renal pelvic cancer	
	Respiratory carcinoma in situ	
	Ischaemic heart disease	
	Chronic obstructive pulmonary disease	
	Parkinson's disease	
	Pulmonary circulation disease	
	Cardiac dysrhythmias	
	Heart failure	
	Stroke	
	Atherosclerosis	
	Pneumonia	
	Crohn's disease	
	Ulcerative colitis	
	Ectopic pregnancy	
	Spontaneous abortion	
	Antepartum haemorrhage	
	Hypertension in pregnancy	
	Low birthweight	
	Premature membrane rupture	
	SIDS (and smoking during pregnancy)	

Some reviewers have suggested alternative interpretations of epidemiological data from other countries. However, as non-epidemiologists we have considered it appropriate to use the authoritative Ridolfo and Stevenson (2001) Australian work as published.

It is acknowledged that there are a number of conditions (such as depression and anxiety) for which aetiological fractions have not yet been developed but for which there is already evidence relating to drugs as a causal factor. However, without attributable fractions the associated costs cannot yet be quantified.

Causal interactions between drugs

English *et al* (1995) acknowledged the possibility of double-counting of drug-caused deaths in a situation in which the estimated numbers of deaths attributable to each of the drugs (alcohol, tobacco and illicit drugs) were added together to give a total for all drug-caused deaths. They identified ten possible conditions which could be subject to possible drug interactions in which more than one drug could be implicated.

After examining the epidemiological evidence they concluded that interaction occurred in relation to only three conditions – oropharyngeal cancer, laryngeal cancer and fire injuries. In all three cases the interaction was between alcohol and tobacco. On the assumption of double-counting of deaths from all three conditions, the number of deaths for 1998-9 would be overestimated by 2.2 per cent (393 cases) of total deaths from all drug attributable conditions in that year.

The significance of this double-counting from the point of view of the present study is that, while estimates of the social costs of individual drugs are not affected by the problem, there is some slight overestimation involved when individual drug costs are aggregated to yield total drug costs. Accordingly, to eliminate the possible effect of double counting we discount the aggregate estimates by 2.2 per cent, the extent of the estimated double counting.

Costs and benefits of alcohol consumption

Interpretation of estimates of the social costs of alcohol use and misuse is more complex than for tobacco or illicit drugs. For some medical conditions alcohol consumption at appropriate levels can have a protective effect, that is, alcohol consumption can reduce the risk of illness or death. With minor exceptions in relation to tobacco, there is no evidence of any analogous health benefits from consumption of the other drugs.

Table 5 below presents a summary of the alcohol-attributable conditions for which Ridolfo and Stevenson (2001) indicate that the abstinence-based aetiological fractions are negative. Abstinence-based means that the aetiological fractions reflect the risks (and the benefits) of alcohol at all levels of consumption relative to a baseline of complete abstinence from alcohol. A negative aetiological fraction means that alcohol consumption has a protective effect against the relevant condition.

Table 5, Alcohol-attributable conditions for which the abstinence-based aetiological fractions are negative

Males	Females
Ischaemic heart disease	Ischaemic heart disease
Supraventricular cardiac dysrhythmias	Supraventricular cardiac dysrhythmias
Cholelithiasis	Cholelithiasis
Stroke – ischaemic (1)	Stroke – ischaemic
	Stroke – haemorrhagic
	Hypertension
Heart failure	

(1) In relation to ischaemic strokes in males, alcohol offers only minor protective effects which occur only at the age of 80 or above.

A notable feature of this table is that it indicates that alcohol consumption has a protective effect against strokes in women but virtually no such protective effect in men. This finding is due to the much higher risk faced by women who consume harmful quantities of alcohol of having a stroke compared to abstainers. The relative risk in men is significantly lower.

Ridolfo and Stevenson (2001) also present aetiological fractions for hazardous and harmful alcohol consumption, as defined by the National Health and Medical Research Council (NHMRC) relative to low alcohol consumption. This reflects the approach adopted by English *et al* (1995) in their earlier comprehensive study of drug-attributable mortality and morbidity in Australia. It represents the extra effect of alcohol consumption for the "unsafe" drinker compared with the responsible drinker. In all cases (except for minor protective effects against cholelithiasis) the aetiological fractions calculated on this basis are positive. That is, in all cases, they indicate the existence of harmful effects. Thus the English *et al* approach eliminates the protective effects (the benefits) of alcohol consumption. English *et al* justified their approach as follows:

> Given that the object of public health intervention in the alcohol education field is 'unsafe' drinking (i.e. hazardous and harmful drinking as defined by the NHMRC, 1992), it stands to reason that the exposure contrast of greatest interest in the underlying epidemiology should be that between the 'unsafe' drinker and the responsible drinker; not between the drinker and the non-drinker.

English *et al* did, however, proceed to make the following point:

> Nevertheless, it is acknowledged that there are some specific policy initiatives for which an aetiological fraction based on zero consumption may still be necessary. For example, estimates of the overall social costs and benefits of alcohol consumption require that the baseline be no alcohol intake rather than a 'safe' level.

Source: English et al (1995), pp. 57-8.

The present authors contend that economic estimation of the social costs of drug abuse should also take into account any social benefits, that is negative social costs, of drug abuse. (As is indicated below, from a public drug policy perspective private costs and benefits of drug consumption are almost always irrelevant.) Benefits resulting from protective effects of drug consumption arise to a significant effect only in the consumption of alcohol. It is for this reason that the present study, as well as our two previous studies of the social costs of drug abuse, all use aetiological fractions calculated on an abstinence basis.

It does, incidentally, appear to be the case that even so-called "responsible' levels of alcohol consumption can be dangerous in relation to certain medical conditions, for example female breast cancer. In addition, even risky/high risk drinking can prevent some deaths (while causing far more).

As a result of the existence of both harmful and protective effects of alcohol consumption, there exists the potential for substantial misinterpretation of alcohol cost data. This is particularly the case when considering policies designed to minimise alcohol-related harm.

Table 6 below analyses the impact of estimated alcohol-attributable deaths by deaths caused and by deaths prevented. It also presents the same analysis for hospital beddays. This table illustrates the potential pitfalls of interpreting the aggregate death or bedday figures, without considering the components of aggregate data.

Table 6, Alcohol-attributable deaths and hospital beddays, 1998-9

	Deaths	Hospital beddays
Male		
Caused	3,187	268,724
Prevented	(2,683)	(115,402)
Total male	504	153,322
Female		
Caused	1,099	125,693
Prevented	(4,347)	(140,041)
Total female	(3,248)	(14,348)
Male and female		
Caused	4,286	394,417
Prevented	(7,029)	(255,443)
Total male and female	(2,744)	138,974

Note: figures in brackets represent saved lives or hospital beddays.

Consider the total male alcohol-attributable deaths of 504. This figure is derived by subtracting the number of deaths prevented as a result of the protective effects of alcohol (2,683) from the number of deaths caused (3,187). It is estimated that in total in 1998-9 alcohol caused 4,286 deaths but prevented 7,029. When examining the potential benefits of policies designed to prevent alcohol misuse, the relevant number of deaths is 4,286. Similarly the number of potentially preventable hospital beddays is 394,417, not the net figure of 138,974. As always, interpretation of these data has to be undertaken with care.

A paper by Chikritzhs, Stockwell *et al* (2002, submitted) makes the same point from a slightly different perspective. They examine the numbers of lives lost and lives saved in 1998 due to low risk and risky/high risk drinking, compared with a baseline of complete abstinence. Their aggregate numbers of lives saved differ slightly from those presented above, largely as a result of the different time periods of the two analyses, but indicate a similar direction.

Table 7, Estimated numbers of lives lost and saved due to low risk and risky/ high risk drinking when compared to abstinence in Australia

	Low risk drinking	Risky/high risk drinking	All drinking
Lives lost	1,505	3,294	4,799
Lives saved	(6,605)	(557)	(7,162)
Total	(5,100)	2,737	(2,363)

Note: figures in brackets represent numbers of lives saved.
Source: Chikritzhs, Stockwell et al (2002), Table 1.

They conclude that:

> It is recommended that for future reports on alcohol-caused morbidity and mortality, there would be value in presenting a more detailed picture that identifies both the costs and the benefits of low risk drinking and risky/high risk drinking. In order to do this, an abstinence-based contrast must be adopted.

The present report, in its results presentation, provides a slightly different distinction – mortality caused and prevented, together with morbidity caused and prevented. However, the interpretational message remains the same.

Of the total lives saved as a result of alcohol consumption, 94.2 per cent occur at the age of 60 or above. 79.7% of hospital bed days saved accrue to this age group.

Costs and benefits of tobacco consumption

In general the costs of tobacco consumption, in terms of deaths and hospital bed days caused, are much higher than for alcohol. Tobacco consumption yields some slight benefits although, unlike alcohol, these benefits are proportionately very small. Nevertheless, for consistency it is appropriate to provide details of these benefits.

Table 8 gives details of the tobacco-attributable conditions with negative aetiological fractions, that is against which tobacco provides some protective effect.

Table 8, Tobacco-attributable conditions for which the aetiological fractions are negative

Males	Females
Parkinson's disease	Parkinson's disease
	Hypertension in pregnancy
	Endometrial cancer

The breakdown of tobacco-attributable deaths and hospital bed days into the caused and saved categories is presented in Table 9.

Table 9, Tobacco-attributable deaths and hospital beddays, 1998-9

	Deaths	Hospital beddays
Male		
Caused	13,254	621,585
Prevented	(181)	(7,414)
Total male	13,072	614,171
Female		
Caused	6,439	362,669
Prevented	(83)	(11,407)
Total female	6,357	351,262
Male and female		
Caused	19,693	984,254
Prevented	(264)	(18,821)
Total male and female	19,429	965,433

Note: figures in brackets represent saved lives or hospital beddays.

The savings in lives and bed days are trivial compared with the costs imposed. Of the total lives saved as a result of tobacco consumption, 98.5 per cent occur at the age of 60 or above. 54.7% of hospital bed days saved accrue to this age group.

3. Issues involved in defining and identifying the costs of drug abuse

The definition of costs

This paper does not provide a complete description of its estimation methodology, which has been extensively described in Collins and Lapsley (1991 and 1996). We present here a discussion of the previous methodology and a description of changes in the methodology and in data and literature sources subsequent to the earlier papers. This paper should, therefore, be read in conjunction with the previous research papers.

The definition of the economic costs of drug abuse used in Collins and Lapsley (1991 and 1996) and again used for the purposes of the present study is:

> The value of the net resources which in a given year are unavailable to the community for consumption or investment purposes as a result of the effects of past and present drug abuse, plus the intangible costs imposed by this abuse.

The concept of drug abuse costs has provoked extensive discussion. Much of the tobacco industry-based criticism of earlier Collins and Lapsley estimates appears to be based upon an inadequate appreciation of the concept of cost presented above. This concept, which has been labelled the demographic approach, is based on the calculation of the size and structure of a hypothetical population in which no drug abuse had occurred. The hypothetical population in this counterfactual situation is then compared with the actual population size and structure, as a basis for estimating drug abuse costs.

Most of the literature on drug abuse cost estimation pays virtually no attention to the implicit counterfactual situation against which the costs of abuse are estimated. For example, Markandya and Pearce (1989), in examining the social costs of tobacco smoking, discuss the effects of the consumption and production of tobacco in generating private and social costs. It is unclear whether the authors are referring to:

- the effects of smoking in a given year (incidence); or
- the effects of smoking over an extended period in the past (prevalence).

To examine the first concept would not be useful since most abuse-related morbidity or mortality in a given year results from abuse in earlier periods. If the social costs of drug abuse were calculated on this basis they would be minimal. Clearly, then, we should be examining the impact of abuse over an extended period of time and this implies comparison with the counterfactual situation in which there was no abuse over this extended period. The comparison is being made between the actual abuse situation over an extended period and a hypothetical alternative situation of no past or present drug abuse.

To postulate a situation of no past or present drug abuse is not to suggest that such a situation is within the realms of possibility. It is, of course, totally implausible. Thus the costs attributed to drug abuse will exceed by a considerable margin the potential reduction in costs available to public policies designed to reduce drug abuse. This issue is developed below in the discussion and estimation of avoidable costs.

Demographic and human capital approaches

The approach to cost estimation adopted in Collins and Lapsley (1991 and 1996) and in the present study has been labelled the "demographic" approach, rather than the "human capital" approach of other studies. The brief comparison of the two approaches presented below is based on that written by the present authors for inclusion in the *International Guidelines for Estimating the Costs of Substance Abuse*, produced by the Canadian Centre on Substance Abuse (Single *et al*, 2002).

Both approaches relate to the valuation of the loss of production arising from the abuse-related deaths of otherwise productive members of society. Both approaches compare production and abuse costs in the actual situation with those in the hypothetical alternative situation which would have existed had there been no past or present substance abuse. The difference between the two approaches relates to the way in which the production costs of premature mortality are treated.

The human capital approach is to estimate the value of the worker's future production stream, brought back to present day values by the use of an appropriate discount rate. A thousand dollars received this year is worth more than a thousand dollars received next year (even if there is no inflation) because this year's resources become available for consumption or investment purposes a year earlier and so can produce interest receipts or profits a year earlier. The use of a discount rate acknowledges this fact and adjusts for the difference between present and future values. Two major problems arise in the human capital approach - how to forecast future production levels and how to choose the appropriate discount rate.

The demographic approach compares the actual population size and structure with the size and structure of the hypothetical alternative no-abuse-population. From this comparison the actual and hypothetical outputs are compared to yield the production costs in the year of study of past and present substance abuse. The major difficulty in this approach is the estimation of the alternative population structure.

The essential difference between the two approaches can be summarised in the following way. The human capital approach calculates the present and future production costs of abuse-induced deaths which occur in the present year. The demographic approach calculates the present production costs of abuse-induced deaths which have occurred in past and present years. Which approach should be adopted depends, therefore, upon which type of information is needed. The two approaches are complementary rather than competitive.

The human capital approach is necessarily always adopted in benefit-cost analysis (BCA) where the nature of the task is to compare, on a common basis, time streams of costs and benefits. Abuse cost estimates can have a different objective. In the case of the present study it is to estimate the costs of drug abuse which are borne in a given year. It can be argued that for the purpose of estimating abuse costs, this is a more comprehensible and useful concept of cost than that delivered by the human capital approach.

If abuse cost studies are to be extended into BCA of proposed drug programs the human capital approach is indispensable. The data sets used in the two approaches are largely overlapping and it would be perfectly feasible to extend the present study to produce human capital-based estimates (see Collins and Lapsley, 2000).

A major problem of both approaches is the valuation of life. The interpretations to be placed on the life valuations differ between the two approaches. The human capital approach estimates the value of the loss of a life. The demographic approach estimates the value of the loss of a year's living.

General equilibrium impacts of drug abuse

The abuse cost concept adopted here, by referring to the resources which would be released for consumption or investment purposes, explicitly avoids the problem of what economists refer to as the general equilibrium impact of drug abuse.

It is often argued that, if an industry producing abused substances ceased to exist, there would be substantial loss of employment, output and income. Thus this employment, output and income are represented to be benefits of drug abuse. For example, ACIL (1994) calculate that the value added of the Australian tobacco industry in 1992-93 was $3.4 billion and they treated this as a benefit to the Australian community (although, according to the Industry Commission (1994), they later "deleted" this estimate). The difficulty with this analysis is the implicit assumption that the opportunity cost of resources used in the drug industry (that is, the value of the sacrificed alternatives, which is their most productive alternative use) is zero. This is an assumption which it would appear impossible to justify. If such a logic were pursued there would be no benefit from microeconomic reform since all resources released as a result of that process would have no alternative uses. It is difficult to imagine that agricultural resources used in the production of abused substances would have zero opportunity cost and it is impossible to imagine that manufacturing and distributive resources would have no alternative use.

A similar problem arises in valuing production losses resulting from substance abuse. If there were high levels of unemployment the loss of production might be small or zero (because the prematurely deceased could be replaced by workers who otherwise would be unemployed). The costs of drug abuse borne by society would apparently be much lower in periods of high unemployment than in periods of low unemployment. Increases in unemployment would apparently reduce drug abuse costs.

These types of issues can only be settled by the use of an appropriately specified econometric model. Even if such models existed, and we are unaware of their existence (although Richter and Gori (1980) made such an attempt), there would still remain, with the human capital approach, the problem of forecasting future rates of unemployment, growth and productivity over the remaining normal lifetime of the prematurely dead. It is not possible to produce robust estimates of the opportunity cost over extended periods of time of resources used in the production of abused substances.

The following point should once again be made explicit. The approach of this paper is to estimate the value of the resources which would have been made available had there been no past or present drug abuse. The use to which these resources would have been put would be largely determined by government macroeconomic and microeconomic policies and is outside the scope of this research.

Avoidable costs of drug abuse

Estimates of the aggregate costs of substance abuse do not indicate the potential returns to anti-abuse policies and programs. The latter figure is represented by *avoidable* costs, estimates of which are presented later in this paper.

It is accepted that the hypothetical alternative situation on which this paper's calculations are based, of no past or present drug abuse, is not achievable under any circumstances. Estimates of the total costs of drug abuse comprise both *avoidable* and *unavoidable* costs. Unavoidable costs comprise the costs which are currently borne relating to past drug abuse, together with those resulting from the fact that some proportion of the population will continue to abuse drugs. Avoidable costs are those costs which are potentially amenable to public policy initiatives and behavioural changes.

Estimates of the avoidable percentages of mortality and morbidity are made in a comparative study by Armstrong (1990). Armstrong proposes an "Arcadian normal", which is the lowest age-standardised mortality rate for the relevant mortality or morbidity category amongst twenty selected, comparable Western countries. The Arcadian normal is the lowest percentage of preventable morbidity and mortality achieved in any of the chosen countries. An implication of its use is to suggest that no further improvement is possible. This constitutes an extremely conservative assumption. Nevertheless the Arcadian normal is a very useful tool for quantification of the percentage of preventable morbidity and mortality and their associated costs which can be reduced, and ultimately avoided. These estimates of potentially preventable mortality and associated morbidity provide the basis for the economic calculations of avoidable costs in this study.

Some avoidable costs of abuse (for example, injuries in road accidents and fires) result in acute harm, and avoidance would result in both immediate and longer term cost savings. Chronic harm, while avoidable, may be reduced or eliminated only over relatively long lead times. These can be of three types:

- Firstly, there are policy implementation lead times, public policies not normally being immediately effective;
- Secondly, even after full and effective implementation of policies, there will be long lead times before the health effects of policy changes are achieved. For example, when previously heavy smokers stop smoking, it takes some years before their health status approaches that of a comparable non-smoker.
- Thirdly, as some costs apply to premature mortality, if the incidence of smoking is reduced it will be years before the population structure reflects the avoidable reduction in abuse, and the associated avoidable costs.

Thus the avoidable cost estimates presented later in this paper assume a sufficiently long time period for the effects of past abuse to be totally removed from the system and for any anti-abuse policies to take full effect. In no sense can the avoidable cost estimates presented here be interpreted to represent potential rapid returns to anti-abuse policies and programs.

A particular problem arises in identifying the avoidable proportions of drug-attributable crime costs and of illicit drug costs generally. Although it is to be expected that appropriate policies could lead to a reduction in these costs, it proved impossible to identify any basis for estimating the appropriate proportion. Accordingly, these costs are excluded from the avoidable cost calculations.

Prevention can be considered from different perspectives, and the calculation of costs of prevention depend on which definition or application is considered. For example, when calculating the percentage of smoking-attributable fires, should the estimate be on the basis of behaviour change in smokers in disposing of cigarettes, or not smoking in bed, or should the preventable percentage refer to the possible reduction in the rate of smoking?

Using the aetiological fractions of estimates of morbidity and mortality and applying the estimates made by Armstrong (1990) of the potentially preventable percentages is a relatively straightforward way to obtain the basis for economic calculation of avoidable costs.

Private and social costs of drug abuse and their policy significance

A fundamental issue of abuse cost estimation is whether the estimates should incorporate the private costs and benefits of drug consumption and production. In the classic work which explores this issue, Markandya and Pearce (1989) define the total costs of drug abuse as the private costs plus the social costs. “To the extent that the costs are knowingly and freely borne by the consumer or producer himself, they are referred to as private costs but to the extent that they are not so borne but fall on the rest of society they are referred to as social costs”. Thus, according to Markandya and Pearce, total costs equal private costs plus social costs. What Markandya and Pearce call social costs are often called external costs.

An important issue, as the two authors point out, is “the extent to which the consumer is aware of the costs that he bears. If his actions are determined by a perceived cost that is in fact less than his actual cost, the difference between the two can be viewed as a social cost”. This is because “the individual himself has not adjusted his behaviour to reflect these higher costs and they are, therefore, unaccounted for”.

In these circumstances individuals are not necessarily behaving irrationally. They are simply adjusting their behaviour according to the best available, relevant, information. As Markandya and Pearce implicitly accept, costs borne by the individual drug abuser can be social costs even if that individual is rational, if those costs have not been knowingly incurred. This point merits further elucidation.

In a private market transaction the consumer is assumed to make a comparison between the costs of purchase and the benefits received as a result of that purchase. If the consumer has proceeded with that purchase it can be assumed that the private benefits exceed the private costs (that is, there is some consumer surplus). But what if, as a result of misperceptions about the level of private costs or benefits, actual private costs exceed private benefits? The community will then be worse off than it would have been had the purchase not gone ahead. The community as a whole (through the purchaser) has borne a cost because of the lack of appropriate information on the part of the purchaser. The purchaser has borne that cost, a social cost.

As an example of this analysis, assume that a motorist purchases a new car in ignorance of the fact that this particular model is liable to burst into flames, with catastrophic implications for its occupants, in relatively minor rear-end collisions. In this theoretical example the fire risk had not been revealed to the population of motor vehicle buyers so that the purchaser had no way of taking it into account in the purchase decision. Had the risk

been known, the purchaser would either have been unwilling to buy that model at all or only willing to buy it at a significantly lower price. In this circumstance the purchaser is worse off because the benefits of ownership of that model are, in the purchaser's own fully-informed estimation, less than the purchase price. The real wealth of society has been reduced by this transaction even though the cost is borne by the private purchaser. (see Collins and Lapsley, 2002).

Thus, the crucial issues in relation to the estimation of the social (external) costs of abuse are:

- Are consumers fully informed?
- Are consumers rational?
- Are consumers required to bear the total costs of their consumption?

If any one of these conditions is not satisfied the resultant costs are social costs. Only if all three conditions are simultaneously satisfied will the resultant costs be private costs. Since the objective of this study is to estimate the social cost of drug abuse, purely private costs are not relevant to, and are not counted in, this study.

Why is so much attention paid to the distinction between private and social costs and benefits? As the Productivity Commission (1999, p. 4.3) says in its report on gambling, it is not because private costs are unimportant...

> in fact, often they are far more significant than the social benefits and costs of an activity. Rather, they generally do not justify government action on the basis that:
>
> - individual actions based on adequately informed and rational decision-making will generally accord with the best interests of the individual concerned;
> - if there are no impacts on other people resulting from these actions which are not accounted for, then what is in the individual's best interests will also be best for society; and
> - if this is the case, there is no way that governments could intervene in individuals' decisions that would improve the welfare of either the individuals concerned or society more broadly.

Thus the existence of private benefits and costs does not normally provide a justification for government intervention, unless the distribution of private benefits and costs is seen to be in conflict with society's concept of fairness.

If the objective were to estimate the **total** costs of abuse, both private costs/benefits and social costs/benefits should be incorporated in the estimates. When only social costs (according to Markandya and Pearce terminology) are estimated, private benefits and costs should be ignored. The present study is concerned with the social costs of drug abuse and so does not estimate the value of purely private benefits and costs. It is social costs which are relevant to the formulation of social policies.

Being fully informed about the private costs of abuse requires the abuser to have access to, and the ability to process and evaluate, epidemiological information on the effects of drug use. It also requires the drug user to be able to evaluate the probable future health and other costs resulting from the drug use. It is difficult to believe that drug users, by their nature, are fully, or even well, informed about the costs of their abuse (Courtwright *et al*, 1989) . Abusers are likely to be less well-informed than non-users, since well-informed users are much more likely to have ceased or avoided abuse.

Potential major sources of information for drug abusers are public health campaigns, advertising by manufacturers and information disseminated by the media. Public health campaigns and media information are highly useful but clearly are not perfect vehicles for conveying relevant health information. Advertising of tobacco and alcohol in Australia has generally provided at best little information other than price and at worst impressionistic images totally at odds with the actual effects of abuse of these products. It should be noted in this context that tobacco advertising in Australia is now illegal.

The question of rationality also raises interesting issues. Rationality, as defined in the paper by Becker and Murphy (1988) on the theory of rational addiction, implies utility maximization over time. Stevenson (1994) says that the theory of rational addiction "assumes that drug users are rational, forward looking utility maximizers who base consumption decisions on full knowledge of the consequences of addiction."

It should be noted that rationality here implies full knowledge. The theory of rational addiction, which has been widely quoted by industry groups as supporting their case, does not merely demand rationality; it demands both rationality and full knowledge. Furthermore, it demands rational behaviour in a situation of full knowledge at the time at which the addiction was acquired. A high proportion of addictions are acquired in early or mid teens when it would seem that the presence of both rationality and full information is unlikely.

The notion of rationality as maximization of utility over time is itself an interesting one. The comparison by an individual of benefits and costs accruing over time can only be undertaken by using some concept of a time preference rate. Are very high time preference rates, which place a very high value on current benefits and a very low value on future costs, rational? Is there any time preference rate which is not consistent with the notion of rationality? If not, rationality seems to lose any significance since any behaviour pattern can be seen to be consistent with utility maximization. But society itself is clearly unwilling to accept all behaviour patterns (for example, self destructive behaviour even when it does not impose social costs).

The present research assumes that addicts do not satisfy the rationality and information requirements discussed above. Ellemann-Jensen (1991) takes issue with this analysis, pointing out that total addiction has been assumed to imply that the smoker enjoys no utility at all from smoking but continues to smoke. He suggests that "such behaviour is clearly in contrast to the hypothesis of utility-maximisation in standard economic theory". In fact, this is not necessarily the case. A 1991 editorial in the British Journal of Addiction suggests that addiction involves, *inter alia*:

- highly compulsive use;
- use despite harmful effects;
- relapse following abstinence; and
- recurrent drug cravings.

In these circumstances, the objective of drug consumption may well be to avoid highly unpleasant effects of withdrawal rather than to gain any positive benefits. Since the withdrawal effects result from previous consumption of the addictive drug, avoidance of these effects can hardly be viewed as a benefit of drug consumption. Short-run utility maximisation need not necessarily imply long-term positive overall benefits from drug use. Rational behaviour of an addict is not the same as rational behaviour of a person contemplating acquiring an addiction, and the two cannot be equated.

The concept of drug abuse

The definition of tangible abuse cost used in this study refers to the extra resources which would have been available if there had been no past or present abuse. This implies that, had there been no abusive consumption, the resources devoted to satisfying those consumption demands would have been released for other consumption or investment purposes. This cost concept, therefore, implies the need for both definition and measurement of abusive consumption.

There is no problem in using the term "abuse" when referring to the consumption of tobacco or illicit drugs, In the case of tobacco, virtually all consumption is harmful to the smoker and/or to others. In the case of illicit drugs, by definition, society has decided to proscribe their consumption, with the implication that any consumption is abuse. However, the use of the term "drug abuse" in relation to alcohol is problematic. There is no concept of alcohol *abuse* in the National Alcohol Strategy (Commonwealth Department of Health and Aged Care, 2001), only alcohol *misuse*. Thus, adopting this terminology, drug abuse is defined for the purposes of this study as consisting of tobacco abuse, illicit drug abuse and alcohol misuse.

A definition of abuse which is meaningful in medical terms is that it occurs when a relevant aetiological fraction is greater than zero, i.e. when drug abuse adversely affects the health of the user or of any other individual. This is a very narrow medical definition which ignores many relevant abuse costs. A more comprehensive economic definition, which encompasses non-medical costs such as accidents and policing, is that drug abuse exists when drug use involves a net social cost additional to the resource costs of the provision of that drug. Abuse occurs if the community incurs net costs as a result of drug abuse.

As discussed above, this study concentrates on social costs because these are the costs that are relevant for the development of public policy. However, the consumption of alcohol and, to a much lesser extent, tobacco can yield social benefits and such social benefits (in effect, negative social costs) are equally relevant for the development of public policy. Accordingly, this study estimates the net social costs (social costs less social benefits) of drug use.

Abusive and addictive drug use

There is a significant literature relating to estimates of abusive consumption which is reviewed in Collins and Lapsley (1996).

Identification of consumption due to addiction requires separate consideration for tobacco, alcohol and illicit drugs. For tobacco it is concluded that there is a small proportion of tobacco consumed which is not addictive. However, from a health perspective all tobacco consumption is abusive, i.e. there is no safe level of consumption. Even those aetiological fractions which are negative for tobacco do not negate the cancers, heart disease and other conditions caused by smoking.

Alcohol presents different challenges from the perspective of the determination of social costs. In Collins and Lapsley (1996) it was concluded that 20% of alcohol consumption was by addicted drinkers. This does not address the issue of misused alcohol which is consumed by non-addicted drinkers, the results of which can include costs of illness, road accidents, violence (including domestic violence), reduced productivity, crime and drug-induced

accidents. It has been possible to calculate costs in relation to most of these categories, but data are still not available to identify all costs, and the costs of misused alcohol remain under-estimated.

As indicated earlier, the consumption of all illicit drugs is treated here as abusive because Australian society has decided that use of these drugs is illegal and that their consumption represents abuse. We are aware that this represents a social decision, but we believe that the costing of abuse should reflect current public policy. It would be inappropriate for a study of this nature to debate public policy.

Costs of consumption of abused drugs

If all drug abuse ceased to exist, the consequent reduction in consumption would release resources which could be used for other consumption or investment uses. Thus, on the basis of the definition of tangible cost adopted in this study and earlier studies, the resources used in abusive consumption represent one of the costs of drug abuse. The correct measure of these resources is the value of consumption rather than the value of production since the latter fails to take into account imports or exports of the abused substances. Data on consumption at market prices must be adjusted to a basis of factor cost by deducting taxes less subsidies.

Estimating the turnover of illicit drugs provides serious difficulties. Because the market is illegal, there are no national accounts data on consumption. The street value of illicit drugs is not a useful measure from the point of view of this study because a high proportion of the street value represents a return for the risks involved in drug dealing. The resources used in illegal drug activities would, in their alternative uses, undoubtedly command much lower rates of return. If dealing in or use of the drugs in question did not attract legal sanctions, their prices would be very much lower, although presumably if illicit drugs were legalised they would be taxed.

The Australian Institute of Criminology Drug Use Careers of Offenders (DUCO) survey provides estimates of expenditures on illicit drugs by prisoners prior to their incarceration. These expenditure data, weighted by prevalence rates for frequent drug users, are used here to estimate the street value of traded drugs, which is then discounted to adjust for the risk component of street values. For the purposes of estimation it is assumed that the legal market turnover for most illicit drugs would be only about five per cent of estimated current street value. The percentage relating to cannabis is assumed to be somewhat higher at 25 per cent, mainly because the risks of detection of cannabis dealing appear to be lower than for the other drugs and because the resources used in producing the drug in Australia have significant opportunity costs. It is our view that this process of analysis yields a value for the resources used in the consumption of illicit drugs which is a conservative estimate of the true value.

The incidence of abuse costs

This paper follows the recommendations of the *International Guidelines for Estimating the Costs of Substance Abuse* (Single *et al*, 2002) in attempting to identify the incidence of drug abuse costs, that is who bears these costs. Abuse costs can be viewed as a form of tax imposed upon various sections of the community. Accordingly, the incidence of these costs

can be analysed using the principles of tax incidence analysis developed in the public finance literature.

Tax analysis makes the distinction between legal incidence and effective (or economic) incidence. Legal incidence indicates which individuals or organisations are legally required to pay the tax to the revenue authorities. Economic incidence describes who ultimately bears the tax after all the economic adjustments resulting from the imposition of the tax have been worked through. For example, a manufacturer might be required to pay increased GST (legal incidence) but the tax might be passed on to the consumer in the form of higher prices (effective incidence). It is relatively easy to identify the legal incidence of a tax. Determination of effective incidence, on the other hand, will at best be very difficult.

Drug abuse costs are treated in this study, for the purposes of identifying their incidence, as a form of tax. We attempt to estimate here the impact incidence (the equivalent of the legal incidence) rather than the effective incidence, which would be an extremely complex process beyond the scope of the present study.

Social costs of drug abuse can bear upon one or more of four community groups (neither private costs nor private benefits being estimated in this study):

- Ill-informed or addicted drug users;
- Other individuals;
- Business; and
- Government.

There are various mechanisms by which these groups could shift the abuse costs to other groups. Some of these mechanisms are indicated in the Table 10.

Table 10, Mechanisms of cost shifting

Cost initially borne by	Means by which cost is shifted	Cost shifted to
Drug users	Lower work productivity at existing wage rates	Employers
Other individuals	Lower work productivity at existing wage rates	Employers
Business	Higher prices or Lower wages or Lower tax payments	Consumers or Employees or Government
Government	Higher taxes or Lower expenditures	Taxpayers (private and business) or Beneficiaries of government expenditures (private and business)

This table makes it immediately apparent how difficult it would be to identify the nature and extent of these economic adjustments resulting from drug abuse. No attempt is made here to do so. The incidence identified here is the impact incidence upon the three major groups – individuals (ill-informed and/or addicted abusers and other individuals), business and government.

By their nature, intangible costs cannot be shifted. For example, the costs of loss of life cannot be passed on to others. Thus individuals bear both the impact and the effective incidence of all intangible costs.

Active and involuntary smoking

This study disaggregates the costs of smoking into active and involuntary components. The more usual distinction is between active and passive smoking (sometimes called sidestream smoke or environmental tobacco smoke). However, all three phrases have their limitations in that they appear to indicate that the only mechanism by which smoking affects non-smokers is by the latter's inhalation of tobacco smoke. There are, however, other mechanisms by which smoking can affect non-smokers. As an illustration, pregnant mothers who smoke are likely to impose adverse health effects on their unborn children (for example, through low birthweight or sudden infant death syndrome). Thus the term "involuntary smoking" is to be preferred and is adopted in this study.

To clarify this distinction, medical conditions attributable to active smoking occur as a result of smokers inflicting adverse health effects on themselves. Conditions attributable to involuntary smoking occur when smokers inflict adverse health effects on others (including the unborn).

This study assumes that all smoking-attributable conditions suffered by people aged less than fifteen years reflect involuntary smoking. The grounds for this assumption are that juveniles under the age of 15 either will be non-smokers or will not have smoked for a period of time long enough to have acquired smoking-attributable medical conditions. At ages of 15 and above, only conditions specifically identified by Ridolfo and Stevenson (2001) as resulting from passive smoking are assumed to reflect involuntary smoking.

It has been demonstrated by Ricardo and Stevenson (2001) that, on current medical evidence, the overwhelming proportion of the morbidity attributable to involuntary smoking, as well as a high proportion of involuntary smoking mortality, is borne by the young.

Table 11 below lists the conditions assumed by this study as resulting from involuntary smoking.

Table 11, Involuntary smoking-attributable conditions

0-14 years of age	15 years of age and over
Tobacco abuse	Lung cancer (passive)
Antepartum haemorrhage	Ischaemic heart disease (passive)
Hypertension in pregnancy*	
Low birthweight	
Premature rupture of membranes	
SIDS (and smoking during pregnancy)	
Fire injuries	
Asthma (under 15 years)	
Lower respiratory illness (under 18 months)	
SIDS (and post natal smoking)	

** In relation to this condition, there is evidence that smoking has a slight protective effect*

It could be argued that alcohol consumption can have analogous involuntary effects in that people are killed or injured as collateral consequences of alcohol misuse.

Revenue impacts of drug abuse

It is often asserted that, even if the social costs of abuse of tobacco and alcohol are high, the revenues derived by governments from taxing these drugs more than cover the costs imposed on governments. This argument cannot be made for illicit drugs, which yield no tax revenues, and which may indeed lead to a net revenue loss as a result of tax evasion and money laundering.

This apparently straightforward revenue/expenditure comparison, when subject to careful analysis, is far more complex. This can be best illustrated by taking the example of tobacco which, in terms of estimated social costs, is by far the most serious problem drug in Australia.

At the outset it should be conceded that, as will be seen later in this report, tobacco tax revenue does in fact exceed by a considerable margin the tobacco-attributable costs borne by the government sector. This fact is often interpreted to mean that “smokers pay their way”.

However, smokers themselves bear a significant proportion of the social costs of smoking, for the reasons discussed above. It is, to a very large extent, the tobacco industry which imposes the social costs, not the smokers. The question “Do smokers pay their way?’ is, in fact, the wrong question. The correct question is “ Does the tobacco industry pay its way?” This question is easily answered in the negative.

There is a great deal of persuasive evidence that the demand for tobacco is relatively unresponsive to changes in tobacco prices. In the economic jargon, the demand for cigarettes

is price-inelastic. Tax analysis shows that in these circumstances a high proportion of the tax is borne by the buyer not the seller. This implies that the industry which is responsible for the imposition of high social costs pays only a small proportion of the tobacco tax revenue.

Estimation of the budgetary impact of smoking indicates whether tobacco tax revenue compensates governments for the revenue and expenditure impacts of smoking (that is, whether smoking reduces budget deficits). It gives no indication of whether the sector that imposes the social costs compensates those sections of the community which bear the costs. These costs are borne by smokers, other individuals and the business sector. (Governments merely pass on the costs borne by the public sector costs to the general community, by taxation or other means).

The same argument holds for alcohol, the other drug whose use is directly taxed. If drug producing industries are to compensate the rest of the community fully for the negative externalities which they generate, drug tax revenues should substantially exceed drug-related public expenditures.

In examining the budgetary impact of drug abuse, the obvious comparison is between expenditures undertaken and revenue generated. It should, however, also be recognised that drug abuse **reduces** revenue from some types of taxes. Abuse-induced mortality and morbidity will reduce income tax revenue as a result of a reduction in the size of the employed workforce. Indirect tax revenues will also be reduced as a result of the effect of mortality in reducing consumption expenditure levels. There would be other, relatively minor, effects on the revenue from such taxes as fringe benefits tax, payroll tax and company income tax. However, as explained below, the revenue from these latter types of taxes should be excluded from the analysis because they do not discriminate against the alcohol or tobacco industry in any way. All industries must bear these taxes at the same rates and they can, at least partially, be viewed as benefit taxes which finance services provided by government to industry generally. They are, accordingly, not incorporated in the budgetary analysis of this study.

Indirect taxes (which are calculated net of subsidies) are taxes which are assessed on producers in respect of the production, sale, purchase or use of goods and services and which are charged to the expenses of production. Examples are wholesale and excise taxes. Revenue from indirect taxes declines as a result of drug abuse because premature mortality reduces consumption levels and so reduces tax revenue raised from that consumption expenditure.

Indirect tax revenue losses (net of subsidy gains) are estimated by applying the ratio of indirect taxes to private final consumption expenditure to the estimated consumption reduction resulting from premature mortality. Indirect tax data are derived from *Australian National Accounts: National Income and Expenditure*.

The present study presents estimates of the budgetary impacts at Federal and State levels of tobacco and alcohol use, incorporating the revenue-contraction as well as the revenue generation effects of smoking and alcohol consumption. It should be noted that the budgetary impact of abusive consumption is estimated, not the impact of total consumption (although these amounts are the same in relation to tobacco and illicit drugs).

There is a fundamental flaw in analyses often presented by the tobacco and alcohol industries on the revenue and expenditure effects of their industries. To include in the analysis **all** revenues attributable to the particular drug implies that the industry, in the absence of taxes targeted specifically at it, would be required to pay no taxes at all. It is quite

wrong to attribute all tax revenue from alcohol or tobacco to be raised as compensation for the abuse-related externalities, rather than attributing some to the tax burden that is inevitably borne by all industries, whether they impose negative externalities or not. If there were no externalities, alcohol and tobacco would still bear sales or other consumption taxes consistent with the tax burden borne by other commodities.

This point can be illustrated clearly in relation to the current goods and services tax (GST) regime. Virtually all goods and services are subject to GST at a rate of ten per cent. Thus the tax is almost completely non-discriminatory between products and between industries. In considering the tax contributions of the tobacco and alcohol industries, GST revenue should be excluded, since only taxes which specifically discriminate against these drugs are relevant to the revenue/expenditure comparison.

In practice, the difficulty here is that, until the introduction of the GST in July 2000, all consumption taxes were to some extent discriminatory. The consumption taxes imposed on tobacco and alcohol in the financial year 1998-9 were:

Alcohol	Tobacco
Excise tax (on beer and spirits)	Excise tax
Sales tax (on beer, wine and spirits	Customs duties
Customs duties (on beer, wine and spirits)	

The revenue analysis of this paper incorporates all the above consumption taxes.

Prior to 1997 the States levied franchise fees (in effect an *ad valorem* tax) on tobacco and alcohol. However, in August 1997 the High Court ruling in the *Ha and Lim* and *Hammond* cases cast into doubt the constitutional validity of franchise fees, which were quickly abandoned. As a result the Commonwealth agreed to compensate the States for this revenue loss by increasing the rates of customs duties on tobacco and wholesale sales tax on alcoholic beverages. The revenue from these increases (less administrative costs) was returned to the States as Revenue Replacement Payments (RRP). For the purposes of the present study RRPs are treated as State tax raisings.

Welfare

Drug abuse can cause increased reliance on social services of various kinds. These may be physical support services, such as the provision of supported accommodation, or income support, such as unemployment or disability benefits. Evaluation of the social costs of these services must avoid the inclusion of pecuniary costs.

The distinction between real and pecuniary costs as applied to the analysis of welfare is expounded in some detail in Collins and Lapsley (1991, pp. 56-8). It can be broadly summarised as follows. Where service provision involves the use of resources which would otherwise have been available to the community as a whole for other uses (for example, accommodation costs or the administrative costs of the support system) the resources used are real. These costs should be included in social cost estimates. Income support, on the other hand, usually represents a pecuniary transfer from one section of the community to another. The resources available to the community as a whole (as opposed to the taxpaying community) do not change as a result of the process of income support, although they may result in very different types of expenditures and savings. Consequently, these costs do not

constitute a valid component of social cost estimates, though they certainly can represent an important budgetary cost to government.

The Department of Family and Community Services submission to the House of Representatives Standing Committee inquiry into substance abuse in Australian communities identified two areas where it was possible to make at least some estimate of the cost impact of drug abuse.

It analysed the group of Newstart and unemployed Youth Allowance clients who were exempt from activity test requirements because of an identified alcohol or other drug dependency. Around 0.8 per cent of its client group was identified as drug dependent. This suggested that the identified substance abuse costs to the Commonwealth for these two payment types alone may be around $68.6m. p.a. The report does not indicate the year for which this estimate was made, nor was it possible to disaggregate these costs between alcohol and illicit drugs.

The other area for which a cost estimate is presented is the Supported Accommodation Assistance Program (SAAP). The 1998-9 SAAP National Data Collection indicated that 6.1 per cent of SAAP support periods in 1998-9 was attributable to drug/alcohol/substance abuse as the main reason for seeking assistance, involving 6,710 people. The submission estimated an indicative cost of Commonwealth expenditure on clients receiving these support services at $8.5m. in 1998-9. Again, it was not possible to disaggregate these costs by type of drug.

Neither of these estimated costs have been used in the results presented later in this paper. It was not possible to attribute these costs individually to alcohol or other drugs, and a high proportion of Newstart and Youth Allowance payments are likely to represent pecuniary rather than real costs.

It might be suspected that the above costs represent only the tip of a drug-attributable welfare costs iceberg. The impact of drug abuse may well be spread over a much broader range of support services and payments than those discussed above. It is plausible to suspect that smoking-attributable diseases are also a factor in the demand for welfare services such as disability pensions. Further, provision of these types of services is not the exclusive domain of the Commonwealth. They are also provided by sub-national governments and by non-government organisations. There is clearly scope for further research in this area.

Production losses in the paid workforce

Drug abuse can have an important impact upon the productivity of the paid workforce in three ways:

(a) Reduction in the size of the available workforce as a result of drug-attributable deaths and illnesses causing premature retirement;

(b) Increased workforce absenteeism resulting from drug-attributable sickness or injury;

(c) Reduced on-the-job productivity as a result of drug-attributable morbidity.

These three components are now considered in detail.

Reduced workforce size

The definition of the tangible costs of drug abuse upon which the present research is based is:

> The value of the net resources which in a given year are unavailable to the community for consumption or investment purposes as a result of the effects of past and present drug abuse.

To estimate the workforce impact of drug abuse on costs as defined here, the size of the actual workforce in the financial year 1998-9 is compared with the workforce size estimated on the assumption that there had been no past or present abuse of the drug in question. An estimate is then made, from national accounts data, of the difference in potential production levels between the actual workforce and the counterfactual, no abuse, workforce.

Absenteeism

Since the time at which the research for Collins and Lapsley (1996) was undertaken, new research has been published which permits the use of a more refined estimation technique for drug-attributable absenteeism. Bush and Wooden (1994) studied the impact of smoking and alcohol on absences from the workplace. Their conclusions can be summarised in the following quotations:

> After controlling for the effects of other variables, smokers were found to be 1.4 times more likely to be absent, and ex-smokers to be 1.3 times more likely to be absent than those who have never smoked.
>
> In particular, interaction between smoking status and sex produced probabilities of absence that were different for men and women. For male smokers the probability climbed to 1.7 times greater than those who have never smoked and for female smokers the probability of absence decreased slightly to 1.2 times greater than those who have never smoked.
>
> Those in the harmful alcohol consumption health risk category defined by the NHMRC are about 1.2 times more likely to be absent than other drinkers and those who do not drink.

These conclusions were applied to Australian Bureau of Statistics (catalogue number 6342.0) surveys of employee absences from work and their causes in two week periods in August 1995, August 1997 and August 2000. The data on absences are classified by type of leave taken so that it is possible to disaggregate sick leave from other causes of absences. The estimated fortnightly data for August 1998 are grossed up to annual values by use of Health Insurance Commission data on the numbers of Medicare professional attendances for the month of August and for the full financial year.

The Bush and Wooden (1994) data, together with prevalence data on smoking and drinking (see Miller and Draper, 2001), permit the estimation of the excess absenteeism attributable to the individual drug user categories “regular smokers”, “ex-smokers” and “harmful drinkers”, compared with the rest of the workforce.

While Bush and Wooden do not estimate the probability of absenteeism due to consumption of illicit drugs, it seems a reasonable assumption that the relationship between absenteeism

in the workforce and the number of attributable hospital beddays for patients of workforce age is similar for tobacco and illicit drugs. Thus, this ratio is used to estimate the absenteeism attributable to illicit drug use. It seems plausible that a higher proportion of illicit drug users than smokers are unemployable. If this were the case, the above methodology would tend to underestimate illicit-attributable absenteeism.

On-the-job productivity

It has not been possible to identify research from which a reliable estimate of drug-attributable reductions in on-the-job productivity could be produced.

Production losses in the household sector

Drug-attributable sickness or death causes production losses not only in the paid workforce but also in the unpaid household sector. The total economy of a nation consists of both market and non-market sectors. The non-market sector uses in an unpaid capacity considerable human resources for the production of goods and services which are directly consumed by households without going through the market. These activities, though productive, are in almost all cases not included in conventional national accounts statistics (see, for example, System of National Accounts, 1993).

The estimates presented here of the value of production losses in the household sector are based upon ABS estimates of unpaid work in the publication *Unpaid Work and the Australian Economy 1997* (5240.0). The definition of unpaid work used in an earlier ABS study is as follows:

> Household production consists of those unpaid activities which are carried on, by and for the members, which activities might be replaced by market goods or paid services, if circumstances such as income, market conditions and personal inclinations permit the service being delegated to someone outside the household group.

A household activity is considered as unpaid work if an economic unit other than the household itself could have supplied the latter with an equivalent service. The ABS estimates take account of domestic activities, childcare, purchasing of goods and services, and volunteer and community work. All are services which will be lost by the community in the event of the severe sickness or death of the person supplying them, and so which should be counted as a component of social cost.

The ABS reports four possible valuation methodologies – individual function replacement cost, housekeeper replacement cost and opportunity cost (gross and net). The valuation method chosen for the purposes of this study is that which is preferred by the ABS, the individual function replacement cost. This method assigns values to the time spent on household production by household members according to the cost of hiring the market replacement for each individual function.

The values derived from the ABS estimates, updated to 1998-9 levels, are applied to data on drug-attributable mortality and morbidity from Ridolfo and Stevenson (2001) to yield estimates of production losses in the household sector.

Hospital costs

Hospital costs form a significant component of health care costs, particularly in relation to the costs of tobacco. This study applies well-validated case-mix costs to the episodes of hospital care which been calculated from the aetiological fractions. Costs derived from the identified morbidities therefore reflect actual hospital costs of drug caused or associated morbidity, rather than average hospital costs.

It has already been acknowledged that it is difficult to compare costs estimated in previous years with the costs estimated in this study. Potential comparisons are especially difficult in the case of hospital costs. While overall hospital costs have been increasing, lengths of stay for most morbidities have been decreasing and patients are treated more intensively during their inpatient stay. A greater amount of acute care is being provided outside acute hospitals, or provided within hospitals as services to non-inpatients. Medical and pharmaceutical costs identify some of these services, but it has still not been possible to cost allied health services, nor other non-medical health services provided within the community.

Net hospital bed-days attributed to alcohol-caused or -related morbidities have reduced since our previous studies, primarily due to the recalculation of the aetiological fractions, which demonstrate an increasing protective effect of moderate alcohol consumption.

Since the most recent iteration of the aetiological fractions, English *et al* (2002) have published the results of a survey in Busselton demonstrating that compared with non-smokers, smokers had more hospital separations and used more hospital bed-days. They conclude that smoking is a major contributor to hospital use in Australia.

Nursing homes

Residential care for the sick and disabled aged population has an attributable fraction, derived from the calculation of primary conditions and co-morbidities of people using residential aged care. The estimates have been made only for residential care, and do not include the costs of community care services. This results in an underestimate of aged care costs related to tobacco, alcohol and illicit drug use, as an increasing proportion of services for this population are provided through a range of programs outside residential aged care facilities.

Examples of increased drug morbidity in nursing homes include cases of alcohol-related psychoses leading to dementia, the tobacco-related age impairment of ventilatory function and illicit drug-related conditions of infective endocarditis and true psychoses. One example demonstrated by an Australian study shows that the absence of addiction to tobacco, alcohol and illicit drugs lessens morbidity, delays mortality and reduces the use of health services (Webster and Rawson, 1979).

The proportion of the aged who are in nursing homes because of drug-related conditions varies mainly as a function of geography, socio-economic status and gender.

Drugs cause gross disability in the aged which is more evident in the nursing home population than in the equivalent age cohort in the community. Taking all these factors into consideration, it is estimated conservatively that drug-related morbidity in nursing homes is 15 per cent higher than in the equivalent outside community and that at least 15 per cent of all nursing home admissions have drug-related morbidities.

Pharmaceuticals

The data presented in this section relate to the costs of selected pharmaceuticals prescribed for the treatment of drug-attributable conditions identified in the Ridolfo and Stevenson (2001), and for which hospital and medical services are provided. This is only a partial calculation since it does not include costs of non-prescribed (across-the-counter) drugs consumed in relation to tobacco- or alcohol-attributable conditions, and it has only costed those included in the highest volume Pharmaceutical Benefits Scheme (PBS) drugs.

As discussed previously, an increasing component of treatment and care is provided on a non-inpatient basis, and the estimated costs presented below apply only to pharmaceuticals provided outside the hospital sector. In-patient pharmaceutical costs are incorporated in DRG hospital costs.

As this calculation applies only to prescribed pharmaceuticals to maintain or improve health status for tobacco- and alcohol- attributable conditions, it does not include the costs of abuse or misuse of pharmaceuticals. We recognise that such abuse has significant economic impact, but it has not been possible to calculate those costs.

Ambulance costs

The ambulance costs reported here refer only to ambulance attendances relating to illicit drugs, that is to heroin overdoses. The estimates are derived primarily from two studies, Dietz *et al* (2000) and Degenhardt, Hall and Adelstein (2001). Dietz *et al* studied ambulance attendance at heroin overdoses in Melbourne for three months in 1997-8 and included an estimate of cost per call out. Degenhardt, Hall and Adelstein reported numbers of ambulance call-outs to suspected overdoses in New South Wales from July 1997 to June 1999. This study included only persons on whom the drug protocol was used, and to whom naloxone was administered. It is, therefore, a very conservative estimate.

From the data provided in these two studies it was possible to estimate an Australian total cost for ambulance attendances relating to illicit drugs, although this is almost certainly an underestimate. These costs are borne by State governments.

A third study, Bammer *et al* (1995), used ambulance call-out records to identify attendance at heroin overdoses in the Australian Capital Territory between 1990 and 1993. This study did not provide data suitable for costing purposes, but made useful recommendations for future data collection and research.

It has not been possible to identify ambulance costs for tobacco- and alcohol-related morbidities, with the exception of the Bureau of Transport Economics report of alcohol-attributable ambulance services which appears as a component of drug-attributable road accident costs (see Table 23).

Fires caused by smoking

There is significant evidence that smoking and its associated activities can cause fires. Quantitative evidence for this assertion in Australia comes from research conducted by the Queensland Fire and Rescue Service, which attributes 1.9 per cent of all fires to smokers' materials (excluding matches and lighters). The QFRS also estimates the value of property

damage caused by fires (although it does not list the value of damage by vegetation-only fires).

Assuming that Queensland fire experience reflects that of the rest of Australia, it is possible to estimate average smoking-attributable property damage for Australia as a whole. If it is further assumed that the cost of attendance at a smoking-attributable fire can be represented by the average cost of all attendances, it is also possible to estimate aggregate smoking-attributable fire service costs.

Australia-wide data on numbers of fires and expenditures on fire services are derived from the *Report on Government Services 2000* (Steering Committee, 2000, Attachment 10A). In some of its fire service-related calculations for this publication the Productivity Commission appears to have adopted analogous averaging procedures to those adopted here.

Ridolfo and Stevenson (2001) identify separately tobacco-attributable fire injuries, deaths and hospital beddays, from which it is possible to calculate medical, hospital and nursing home costs. Health costs in this category predominantly reflect the costs of burn injuries caused by fires in bedding and furniture after smokers fall asleep with lighted cigarettes. It also becomes possible to estimate the impact of smoking-attributable fires on labour output in the workplace and in the home, and on lives lost.

Since fire costs do not include valuation of public property damage, such as national parks, loss of animals and of amenity during bush regeneration, they represent conservative estimates of the costs of fires resulting from smoking.

Litter

Costs of litter associated with drug abuse are both tangible and intangible, and apply to each category of drug. Costs are borne by governments, particularly State and Local Governments, and by individuals. There are a number of surveys documenting types and amounts of environmental litter, but none of these studies enable the resource costs or the intangible costs to be identified.

Litter caused by smoking predominantly consists of cigarette butts and cigarette packets which have been thrown away, swept into storm-water drains, or recovered during environmental clean-up days. These costs are not borne by the litterers.

Litter costs associated with alcohol include discarded bottles, cans, ring-pulls, and broken glass. Together with tobacco litter, such litter is ugly, and the presence of litter diminishes the value of scenery, bushland and coasts.

Litter costs attributed to illicit drugs relate to drug paraphernalia, including syringes, and like broken glass comprise a considerable public health hazard. Most of these costs can be substantially reduced through public education and enforced regulation, but it has not been possible to estimate the costs of litter, let alone effective interventions.

Road accidents

The estimates of drug-attributable road accident costs presented here are based on Bureau of Transport Economics (BTE) estimates of aggregate road crash costs in Australia in 1996 (Bureau of Transport Economics, 2000). As a result of changes in methodology and

coverage compared with earlier reports, the 1996 BTE estimates are not directly comparable with earlier estimates (Bureau of Transport Economics, 2000, Table 7.3).

There has for many years been clear evidence that a significant proportion of road accidents is attributable to the consumption of alcohol (Ridolfo and Stevenson, 2001, p.30). Evidence is also now emerging of a causal link between illicit drug use and motor vehicle accidents (Ridolfo and Stevenson, 2001, p.86). There appears to be no convincing evidence that road accidents are causally linked to tobacco consumption. The aetiological fractions presented by the AIHW study, adjusted in the case of illicit drugs to take account of later data (see Austroads Working Group, 2000), are used to estimate the proportions of road accident costs calculated by the BTE which are attributable to abuse of alcohol and illicit drugs. The 1996 estimates are factored to 1998-9 values by use of the Australian National Accounts implicit price deflator for total final consumption expenditure and by the estimated change in the number of road accidents over the period.

However, some categories of road crash costs are calculated by the BTE on a different basis from that used in this study, since the concepts of cost adopted in the two studies differ. In essence, the BTE study uses a human capital approach while the present study uses a demographic approach (for an explanation of this distinction see the section above on *Demographic and Human Capital Approaches*). For costs which are fully borne in the year in which the crash takes place (for example, vehicle repairs and the provision of ambulance services) the distinction has no significance. For others, where costs are ongoing into the future (for example, medical/ rehabilitation services and long term care), this study adopts a different estimation methodology from that of the BTE.

The BTE study estimates road crash costs in the following categories:

Human costs

- Medical
- Ambulance
- Rehabilitation *
- Long term care *
- Labour in the workplace *
- Labour in the household *
- Quality of life *
- Legal
- Correctional services
- Workplace disruption
- Premature funerals
- Coroner

Vehicle costs

- Repairs
- Unavailability of vehicles
- Towing

General costs

- Travel delays
- Insurance administration
- Police
- Non-vehicle property damage
- Fire and emergency services

*The symbol * in the above list indicates that the cost item in the present study has been calculated using a different methodology from that utilised by the BTE.*

For its estimates of drug-attributable hospital costs, labour in the workplace, and labour in the household the present study uses data derived from Ridolfo and Stevenson (2001). These data are more up-to-date than those used in the BTE study.

It is assumed in this study that all legal costs are incurred in the year in which the crash occurs. This assumption yields results close to reality since crashes in a given year may not be fully legally processed in that year but, in compensation, some legal costs will be resulting from crashes occurring in previous years.

The BTE study calculates the value of the quality of life lost as a result of death or injury by reference to compensation payments from the Victorian Transport Accident Commission. The approach of the present report to the valuation of life is to adopt the willingness-to-pay approach discussed below. However, the BTE estimate for the loss of quality of life resulting from road accident injuries is accepted on the assumption that all such costs are borne in the year of the accident. Again, as with legal costs, this assumption yields results close to reality. Pain and suffering resulting from crashes in a given year may extend into future years but, for the same reason, some pain and suffering resulting from crashes in previous years will carry over into the year under review.

The valuation of life

Drug abuse causes premature deaths. How to value the costs to the community of these deaths is the subject of considerable debate in the economic literature.

When a life is lost prematurely the community bears two types of social costs – the loss of productive capacity (a tangible cost) and the psychological effects borne by the deceased and others (an intangible cost). There is a school of thought which argues that, if people are dead, they can be bearing no costs. However, most people clearly wish to postpone death as long as possible and so, just as clearly, have the opinion that premature death is undesirable (and thus, in economic terms, is costly to them).

Valuing the loss of productive capacity is known as the human capital approach. It involves estimating the loss of the future stream of productive capacity and expressing it as a present-day value by the application of an appropriate discount rate. The psychological costs of premature death are estimated using the willingness-to-pay approach, in which researchers identify how much people would be willing to pay to reduce the risk of death in a particular period of time (death not being permanently avoidable). Generally, intangible costs (in this case, willingness-to-pay) are more difficult to value than tangible costs, for which conventional markets (and so market prices) exist. However, the human capital approach has to confront the significant difficulty of choosing an appropriate discount rate. The two approaches are discussed in Bureau of Transport Economics (2000, chapter 3).

If the human capital approach is adopted, premature deaths of people of above workforce age are, by implication, considered to have no social cost since no productive capacity is lost. Indeed some “benefits” could be considered to accrue to the community as a whole since the resources which would have been needed to supply the consumption needs of the deceased are saved. However, the community by many actions (including the allocation of substantial health care resources to the aged) demonstrates clearly that it believes that the lives of people of beyond work force age still to be of value. Thus, while it is important to value the loss of productive capacity, to ignore the psychological costs valued in a willingness-to-pay approach would produce a totally misleading estimate of the social cost of premature deaths.

The present study values the drug-attributable loss of productive capacity in the year under study (a tangible cost) together with the psychological costs of premature death. Consistent with the demographic approach adopted here, the study estimates the value of the loss of one year's living, not the value of a lost life (which can involve the loss of many years of living).

The Bureau of Transport Economics (2000) refers to a range of international willingness-to-pay estimates of the value of life. It indicates that a reasonable valuation of a lost life in Australia in 1996 would be $2m., which is at the low end of the range of international estimates. In this study this figure is adjusted to 1998-9 prices by the Australian National Accounts implicit price deflator for consumption expenditure and converted to the value of a year's living by reference to the average life expectancy of the Australian population (Australian Bureau of Statistics, *Deaths 2000*, Table 7.35).

The average intangible value of the loss of one year's living in 1998-9 prices was calculated to be $46,894.

Pain and suffering

As reported in our previous studies, pain and suffering attributable to road accidents remains the single component of total drug-attributable pain and suffering to which we are able to assign a monetary value. This estimate is derived from the research reported in the Bureau of Transport Economics (2000), but it does not appear possible to extend this estimate to other areas of drug abuse.

Easton (1997) in his New Zealand study has estimated that intangible morbidity costs are of similar order of magnitude to mortality costs. While data are not available to make similar calculations for Australia it is recognised that the results presented here represent a considerable underestimate.

While pain and suffering due to illness and death resulting from drug abuse are intangible costs, with no resource or budgetary impact, they are nevertheless important, and it is hoped that future research will enable further estimates to be made.

Research, education and drug program costs

It has been argued that expenditures on areas such as drug-related education programs or research projects represent the effects of public decisions to reduce abuse rather than the direct effects of use and should be excluded from abuse cost estimates. The *International Guidelines for Estimating the Costs of Substance Abuse* (Single *et al*, 2002) recommend that these costs, although considered relevant to a study of drug abuse costs, should be presented separately as policy costs rather than incorporated in the abuse cost estimates. The present study adopts the criterion that expenditures on prevention of drug abuse and on research concerning appropriate interventions can be seen as discretionary, but that expenditures on the interventions themselves should not treated as discretionary. However, the role of law enforcement certainly includes a significant preventive component, although disaggregation for the purposes of cost estimation does not seem possible.

At the time of the production of Collins and Lapsley (1996), information on drug-related research and education costs was reasonably easy to obtain from Commonwealth Department of Health internal records. The Commonwealth made payments to the States

and Territories through cost-sharing arrangements, and internal processes within the Department separately identified different allocations.

Since that time the ability to estimate these expenditures has declined as the Commonwealth now has different arrangements for making payments to States and Territories. These arrangements no longer separate funding for drug strategy activities from other public health activities. The Commonwealth requires outcome-based reports for this funding rather than information on acquittal of funds. In addition, accounting changes within the Commonwealth Department of Health mean that it no longer separates the funding stream in the previous manner, with consequent difficulties for the attribution of funds to different activities.

In principle, acknowledgement should also be made of expenditures on drug-related research and education by the law enforcement, customs and education sectors. It seems likely that the effort from these agencies is increasing but the information necessary to estimate drug-related expenditures by these bodies is not published, and probably not collected.

The Australian Bureau of Statistics, in its publication on sources of Australian data on illicit drug use, has acknowledged the difficulty of obtaining data on drugs research and education expenditures. It refers to the only published source of such data - a survey of government expenditure on drug programs and services by the Alcohol and Other Drugs Council of Australia (Crosbie and McNiven, 1999) and comments:

> The paper contained data on Commonwealth, State and Territory Government expenditure specifically for drug programs and services through health departments and drug authorities. However, figures were for all drug programs and services, with no distinction between alcohol, tobacco and other drugs, including illicit drugs, and the comparability of data between States was problematic.

Australian Bureau of Statistics, Illicit Drug Use, Sources of Australian Data, 2001 (4808.0, p 43).

4. Estimation of drug-attributable crime costs

This study presents the first estimates of the costs of drug-attributable crime in Australia. Since the production of Collins and Lapsley (1996), which attempted to estimate the costs of only a minor proportion of drug-attributable crime, important new data sources have appeared which for the first time make feasible a reasonably comprehensive exercise.

It is important at the outset to stress that such a study should estimate only those crime costs where a causal connection can be demonstrated between drug consumption and crime commission. A mere association between the two is insufficient for the purposes of this study. To confuse association with causation would result in a vast overestimate of the costs of drug-attributable crime.

Models of the drugs-crime relationship

There are four models which explain different causal roles for illicit drugs and alcohol in relation to the commission of crime (see Pernanen *et al*, 2000 and 2002).

1. The pharmacological or intoxication model. The assumption of this model is that drug intoxication encourages the commission of crimes which would otherwise not have been committed. In alcohol studies, this model is frequently referred to as the "disinhibition" model.
2. The economic means model. This model concerns crimes which are committed to fund the acquisition of illicit drugs or alcohol.
3. The systemic model. This model concerns crimes which result from involvement in the illegal economy related to drugs. It relates to crimes committed, for example, in selling drugs, collecting drug debts or fighting over drug territory.
4. The substance-defined model. This model relates to actions which are defined as being criminal by laws which regulate drug use. Examples of such crimes include drink-driving, drug manufacture and trafficking, and drug possession. All crimes explained by this model will, by definition, have a drug-attributable fraction of 100 per cent. Pernanen *et al* (2002) exclude this type of crime from their calculation of drug crime-attributable fractions on the grounds that drug use does not cause the crime event. The implication here seems to be that only drug-defined crimes committed by dependent drug users should be incorporated in the attributable fractions. This would imply, for example, that drug manufacturing, importing or dealing by a non drug dependent person should not be accounted for in the attribution factors. We are not in agreement this aspect of the Pernanen *et al* approach and so, in common with most of the literature, we treat the drug-attributable fraction for this type of crime as 100 per cent.

Calculations of crime attributable fractions are complicated by the fact that some overlap can be expected between the positive cases in the four models in any population.

> A certain proportion of individuals who committed a crime under drug intoxication were also driven by the motive to get more drugs for personal use, for instance (so as to prevent their supply from running out). In a similar way, some individuals who used violence to collect a drug debt for themselves or for someone else in the distribution chain did so in order to get drugs or the means to buy drugs for personal use.
>
> *Pernanen et al (2000, p.55)*

Methodology

The basic methodology is to evaluate the total costs of a particular activity (for example policing or incarceration) and then to estimate the proportion of these costs causally attributable (as opposed to related) to drug use. Thus the fundamental data needs are

- Aggregate cost data, and
- Attributable fractions.

A variety of sources are used to derive data on aggregate costs, though undoubtedly the most valuable sources are the *Reports on Government Services* by the Steering Committee for the Review of Commonwealth/State Service Provision.

Attributable fractions have been developed for this study by the Australian Institute of Criminology (AIC) and their derivation is fully explained in Appendices C and D. Attributable fractions for prisoners are derived from the AIC DUCO (Drug Use Careers of Offenders) survey data and for police detainees are derived from the AIC DUMA (Drug Use Monitoring in Australia) survey data. DUCO examines the lifetime offending and drug use careers of adult sentenced male inmates in four Australian jurisdictions. The DUMA collection provides illicit drug use information on people who are detained and brought to a police station, from an ongoing survey of four specific sites.

Table 12 presents details of the prisoner attributable fractions (derived from DUCO data) and Table 13 presents details of the attributable fractions for police detainees (from DUMA).

Table 12, Crime-attributable fractions (prisoners), by category of crime, 2001

	Violent	Property	Drug Offences	Traffic Offences	Breaches	Disorder	Drink Driving	Other
	%	%	%	%	%	%	%	%
Illicit drugs only	10.8	23.4	100.0	8.4	15.2	6.3	0.0	15.9
Alcohol only	11.0	4.1	0.0	12.8	12.7	12.6	100.0	11.4
Alcohol and illicit drugs	12.6	9.4	0.0	6.8	10.8	6.3	0.0	17.4
Neither	65.5	63.1	0.0	72.0	61.4	74.8	0.0	55.3
Total drugs	34.5	36.9	100.0	28.0	38.6	25.2	100.0	44.7

Source: Australian Institute of Criminology (see Appendix C).

Table 13, Crime-attributable fractions (police detainees), by category of crime, 2001

	Violent	Property	Drug Offences	Traffic Offences	Breaches	Disorder Driving	Drink	Other
	%	%	%	%	%	%	%	%
Illicit drugs only	27	43	100	17	16	9	0	8
Alcohol only	7	2	0	2	5	15	100	4
Alcohol and illicit drugs	3	1	0	0	0	0	0	2
Neither	63	54	0	81	79	76	0	86
Total drugs	37	46	100	19	21	24	100	14

Source: Australian Institute of Criminology (see Appendix D).

A complication in the derivation of attributable fractions for alcohol from DUMA is explained in Appendix D. The problem is that DUMA questions concerning the causation for their criminal behaviour specifically exclude alcohol. It is, however, possible to produce a range of values within which actual attributable fractions will almost certainly lie. In common with the conservative approach to estimation which is adopted in this paper, the lower bound estimates are used in the calculations and these are the values which are presented in Table 13. Section 6 presents an indication of what would be the impact upon the estimates of drug-attributable policing and crime costs of the application of the upper bound attributable fractions.

To illustrate the meaning of these fractions consider Table 12. Of all violent offences for which prisoners are incarcerated, 10.8 per cent are estimated to be causally attributable to the consumption of illicit drugs and 11.0 per cent attributable to alcohol, with drugs in total explaining 34.5 per cent of violent crime. A complication thrown up by this table is that some component of crime is causally attributable jointly to alcohol and illicit drugs (in the case of violent crime 12.6 per cent). It is not possible meaningfully to disaggregate these joint fractions back to the individual drugs.

In the calculations for this research all drug offences are assumed to be attributable to drugs (the fraction is 100 per cent) and all drink-driving is assumed attributable to alcohol.

It should be noted that the fractions presented in the above two tables apply to a single year, while the strength of the associations could change from year to year.

In both the above tables the counting rule of most serious offence is used, as it is used in Australian Bureau of Statistics data (for example, *Prisoners in Australia*, 4517.0). However, this approach is likely to underestimate the extent of crime and could be distorting crime costs across policing, courts and prisons.

It has been observed from DUMA data that female detainees have much higher levels of illicit drug use than male detainees. Thus, the DUCO fractions, which have been calculated for males only, may understate the costs of crime attributable to female prisoners, who are also more likely to be incarcerated for drug offences.

Types of costs

We now consider calculation methods for the various categories of crime costs.

Policing

It has been suggested in the literature that law enforcement costs can be seen as similar to expenditures on drug prevention campaigns in that they are discretionary. This point is, in our view, invalid. Law enforcement costs would seem to be analogous to, say, health care costs. It would be possible for governments to make the decision to refuse to treat health problems resulting from drug abuse but this would be the reverse of societal expectations and Australian governments certainly do not choose to act in this way. There is no suggestion in the *International Guidelines* or in any published estimate of the social costs of drug abuse that health costs are discretionary and therefore should be ignored. Law enforcement costs appear no more discretionary in nature than health care costs. As a consequence, law enforcement costs have been included in the estimates of drug-attributable crime in the present study.

Steering Committee reports provide comprehensive cost data on policing at State and national levels. The data used are police expenditures net of receipts. These expenditures are allocated to the individual types of crime according to the proportions of detainee hours in police custody classified by most serious offence of detainee. These data are derived from the Australian Institute of Criminology National Police Custody Survey August 1995 (see Carcach and McDonald, 1997), the most recent national data on police detainees. Appropriate proportions of these expenditures, classified according to type of crime, are then assigned to types of drug-attributable crime according to the DUMA (detainee) attributable fractions.

Australian studies show that only around one third of police call-outs result in a crime being recorded. Our analysis implicitly assumes that the drug attributable fractions for police call-outs not resulting in the recording of a crime are the same as for other call-outs.

Criminal courts

Comprehensive cost data are provided by Steering Committee reports. The data used are expenditures net of receipts for all levels of criminal courts. They are allocated to the individual types of crime according to the proportions of police detainees classified by their most offence, data derived from the National Police Custody Survey (Carcach and McDonald, 1997). They are then allocated to drug-attributable crime according to the DUMA (detainee) attributable fractions.

Prisons

Comprehensive cost data are provided by Steering Committee reports. The data used are prison expenditures net of receipts. They are allocated to the individual types of crime on the basis of data from the National Prisoner Census presented in the ABS publication *Prisoners in Australia* (4517.0) and to drug-attributable crime according to the DUCO (prisoner) attributable fractions.

Customs

Services provided by the Australian Customs Service have a variety of simultaneous functions – border protection, immigration controls, prevention of smuggling, quarantine requirements and prevention of import of illicit drugs. In practice there appears to be no way to allocate joint costs between these various functions.

National Crimes Authority

We were unable to identify any basis upon which it would be possible to identify the drug-attributable component of NCA costs.

Forgone productivity of criminals

If prisoners had not been incarcerated their labour would have been released for productive use. However, there is reason to suspect that such labour would not in all cases have been put to productive use. Using data from the National Prisoner Census it is possible to estimate the value in a free market of the potential output of prisoners if they were not currently incarcerated.

Since there are no data available on the number of people engaged in drug-attributable crime but not detained or imprisoned, it is not possible to estimate the potential value of their labour in productive employment.

Private security services and home security

It would appear to be possible, from ABS data, to make very rough estimates of these types of costs. However, they are, in our view, discretionary prevention expenditures and so not relevant to this study.

Property theft

Clearly a considerable amount of property theft is attributable to the consumption of alcohol or illicit drugs. However, conventional economic literature asserts that this type of theft does not represent a real loss to the community as a whole. Rather, as long as the property is not subsequently damaged or destroyed, it represents a redistribution of assets from the victims (or perhaps insurance company customers and shareholders) to the thieves and their customers. We do not accept this argument completely since in the process of theft and resale a significant proportion of the property value is lost. The value of the stolen property to the thief is, in almost all cases, less than its value had been to the victim of the crime. The difference between the two values represents a cost to the community as a whole.

An internal Australian Institute of Criminology paper (see Carcach *et al*) has estimated the value of property theft attributable to illicit drug consumption in 1991-2. No estimates are available for alcohol-attributable theft. The AIC paper produces estimates based on different estimation techniques ranging (in 1991-2 prices) from $7,315m. to $812m. We have used the lower figure as the basis for our estimates, so that it can confidently be asserted that this is at the bottom of the range of possible estimates. This figure takes no account of unreported crime, the extent of which is likely to be considerable. The figure has been updated to 1998-9 values by use of a national accounts implicit deflator.

It is assumed, on the basis of information in Stevenson *et al* (1998), that property on the stolen goods market will raise about 30 per cent of its new value but in a legitimate second hand market would raise about 70 per cent of its new value. This indicates that theft causes social losses of about 40 per cent of the new value of property stolen. The AIC property value estimates are assumed to represent replacement value, not second hand value.

It was not possible to identify data on the basis of which the incidence of property losses (among individuals, business and government) could be estimated.

Violence

Ridolfo and Stevenson (2001) provide evidence on deaths, hospital episodes and beddays resulting from alcohol-attributable violence and these have been applied to DRG data to yield hospital costs. From these data the full costs of such violence can be determined.

Matthews *et al* (2002) provide a detailed analysis of alcohol-related violence in Australia between 1991-2 and 1999-2000.

No such information on illicit-attributable violence is provided by Ridolfo and Stevenson. However, it is possible to determine the relativities between alcohol- and illicit drug-attributable violence, and hence to estimate the social costs of such violence, by use of the violent crime attributable fractions discussed above.

Money laundering

Money laundering has complex economic effects which are beyond the scope of this paper to analyse. AUSTRAC, the Australian Transaction Reports and Analysis Centre, in 1995 produced estimates of the extent of money laundering in and throughout Australia but there appears to be no basis on which it is possible to estimate the proportion of laundered money which is attributable to trafficking in drugs. The Australian Bureau of Criminal Intelligence (2000, p.112) confirms this conclusion.

Illegal sales of tobacco

There is anecdotal evidence of a substantial Australian trade in "chop chop" – illegally manufactured tobacco. This tobacco can apparently be sourced from within Australia or illegally imported. The issue of the extent of this problem and its associated revenue loss is addressed in the Australian National Audit Office's 2002 report on the administration of tobacco excise by the Australian Taxation Office.

> At this stage, the ATO has not been able to fully quantify the revenue loss that can be attributed to chop chop. The ATO's recent attempts to quantify the revenue loss has (sic) been based largely on the assumption that the increasing trends in the importation of cigarette tube and cigarette paper into the country since 1997 can be attributed to the increasing use of chop chop. The ATO acknowledges that several of its assumptions remain to be tested, and the gaps in the current information prevent it from obtaining an accurate estimate of the size and value of the chop chop market.

Source: Australian National Audit Office (2002), p.51

The Australian National Audit Office reports three attempts to estimate the tax revenue forgone as a result of illegal sales of tobacco. These were based on information in the

Australian Institute of Health and Welfare 2001 National Drug Strategy Household Survey, in the 2001 Health Tracking Survey (managed by the Research and Marketing Group of the Commonwealth Department of Health and Ageing) and a PriceWaterhouseCoopers report apparently prepared for The British American Tobacco Australasia group (PriceWaterhouseCoopers, 2001). The Australian National Audit Office (2002) describes the methodologies adopted for the first two estimates. The PriceWaterhouseCoopers report provides only very general information on their methodology for estimating revenue loss. This is unfortunate since, as Table 14 below shows, this revenue loss estimate is by far the highest of the three. The methodology is described in the following way:

> Tobacco industry estimates place the scale of the chop chop market at around 1,500 tonnes per annum, rising to 2,000 tonnes per annum by 2001. These estimates are based on information and observations regarding sales of cigarette tubes, leaf availability, the return of tobacco crops to New South Wales and falls in consumption of legal, roll your own tobacco.

Source: PriceWaterhouseCoopers (2001, p.46).

The revenue loss estimates are summarised in Table 14 below.

Table 14, Estimates of revenue leakage associated with chop chop

	Smoking prevalence rate	Amount of chop chop smoked as a proportion of licit tobacco	Annual excise evaded as a result of chop chop smoked
AIHW Household Survey 2001	21.1%	4.94%	$220m.
Health Tracking Survey 2001	19.8%	2.22%	$99m.
Industry estimates 2001	n.a.	n.a.	approximately $450m.

n.a. indicates not available
Sources: Australian National Audit Office (2002 p.116)
PriceWaterhouseCoopers (2001, p.46).

Given the lack of information on the methodology of the industry estimates, we are unable to make any judgment on which estimate is to be preferred.

Legal expenses

Costs are incurred in the employment of the legal profession in crime-related cases, for example in providing defence services to accused. No data have been located on the basis of which such costs could be estimated.

Under-reporting of crime

It can be asserted with a high degree of confidence that the estimates of the social costs of drug-attributable crime presented below are underestimates of the "true" costs of such crime. Apart from the conservative estimation techniques adopted in the research for this paper, the major reason for this confident assertion is evidence that much crime is not reported to the police.

Carcach (1997) discussed results of the 1993 National Crime and Safety Survey (see Australian Bureau of Statistics, 4509.0), which estimated that the proportions of crime reported to police were 78 per cent for break and enter, 52 per cent for robbery and 32 per cent for assault. Bryant and Williams (2000) concluded that only about 30 per cent of alcohol- or other drug-related violence was reported to the police. Carcach and Grant (2000) reported data from the 1998 National Crime and Safety Survey (Australian Bureau of Statistics, 4509.0) which showed that, respectively 74 per cent and 30 per cent of (most recent) incidents of household and personal offences were reported to police.

5. Comparability with previous social cost estimates

The present authors have previously estimated the social costs of drug abuse in Australia for the years 1988 and 1992. Given that this paper presents estimates for 1998-9, some commentators may be tempted to try to calculate the rate of growth of these costs over time by comparison between the three sets of estimates. It cannot be stressed too strongly that, because of the non-comparability of the present estimates with those presented in the previous studies, such an exercise would be invalid and its results would not be reliable. There are two broad reasons for this lack of comparability.

The first is that the scope of the present study is, in some areas, much broader than previous studies. For example, estimates are made here for the first time of the drug-attributable costs of crime. The non-inclusion of these costs in previous studies did not imply that such costs did not exist. The reason for the non-inclusion was that data which permit such estimates to be made have only recently become available. Other costs estimated for the first time in this study include absenteeism, ambulances, pharmaceuticals and fires.

The second reason relates to the nature of perhaps the most fundamental data source for studies of this kind –aetiological fractions. The aetiological fraction for a particular illness or injury indicates the proportion of such cases with that condition in the population that can be causally attributed to consumption of the drug under. The fraction has two components – the strength of the causal relationship between the drug consumption and the condition (the 'relative risk") and the prevalence of the consumption by the community of the drug under review.

The estimated relative risk represents the current state of knowledge concerning the causal relationship between the drug consumed and the condition under review, and may change as new research evidence emerges. For example, recent evidence concerning the relationship between alcohol consumption and falls suggests that a much smaller proportion of falls is attributable to alcohol consumption than previously thought. Since the prevalence figures for alcohol consumption in Australia were relatively steady during the period under review, the smaller aetiological fractions reported by Ridolfo and Stevenson appear to result from an improved state of research knowledge rather than from a change in the actual cause of falls . Changing knowledge of the causal relationship between drug consumption and illness or injury implies that estimates of, for example, health costs over time are not strictly comparable since they have been calculated on different bases.

Ridolfo and Stevenson (2001) also revised many aetiological fractions as a result of changes in prevalence. However, these revisions do not have any implications for comparability, since changes in prevalence represent real changes over time in the determinants of drug-attributable illness or injury.

6. Some disaggregated costs

This section provides detailed estimates of the costs of crime, health care, production losses, road accidents and fires attributable to smoking. The next section provides overall summaries of costs classified by drug of abuse (alcohol, tobacco or illicit drugs). This form of presentation is adopted to provide comprehensive information on particular areas of costs while avoiding the problem of double counting of some costs. For example, road accident costs include, *inter alia*, productivity losses, for which separate aggregate drug abuse cost estimates are made. Productivity costs cannot be included in both areas without double counting, and yet to exclude them from road accident costs would give the impression that the total costs of drug-attributable road accidents were lower than in fact they are. This problem is overcome in the cases of crime, road accidents and fires by presenting their overall costs as well as "n.e.i." (not elsewhere included) costs which are the values carried over to the aggregate tables. In this way all double counting is avoided.

Crime

Table 15 below presents estimates of drug-attributable crime costs. In interpreting these estimates it should be borne in mind that, as discussed earlier, they are also certainly substantial underestimates as a result of the considerable under-reporting of crimes to police.

As indicated earlier, some component of crime costs is causally attributable jointly to alcohol and illicit drugs. It is not possible to indicate what proportion of these joint costs is attributable to either alcohol or illicit drugs individually.

Alcohol-attributable crime cost $1.7 billion in 1998-9 while crime attributable to consumption of illicit drugs cost $3.0 billion. Crime attributable jointly to both types of drugs cost a further $1.2 billion.

Table 15, Summary of selected drug-attributable crime costs, 1998-9

	Alcohol $m	Illicit drugs $m	Both drugs $m
Tangible costs			
Police	648.2	1,105.4	35.4
Criminal courts	112.5	94.0	2.8
Prisons	96.9	227.9	111.1
Violence	130.7	128.3	149.7
Property	n.a.	364.6	n.a.
Productivity of prisoners	247.0	580.3	283.2
Total tangible	1,235.3	2,500.4	582.3
Intangible costs			
Loss of life (violence)	501.7	492.5	574.6
Total intangible costs	501.7	492.5	574.6
Total costs	1,736.9	2,992.9	1,156.9
Total n.e.i.			
Tangible	1,104.6	2,372.1	432.6
Intangible	-	-	-
Relevant costs as a proportion of GDP	0.42%	0.85%	0.19%

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

As indicated above, alcohol-attributable policing and court costs are based on lower bound estimates of the relevant attributable fractions. Table 16 indicates how these cost estimates would increase if the upper bound attributable fractions were used.

Table 16, Impact upon alcohol-attributable police and court costs of the use of upper bound DUMA attributable fractions

	Lower bound $m	Upper bound $m	Difference $m
Police	648.2	1,219.6	571.4
Criminal courts	112.5	158.0	45.5

Health

Drug-attributable morbidity imposes health care costs for medical services, hospitals, nursing homes and pharmaceuticals. However, the premature deaths caused by drug abuse can relieve the community of some health care cost burdens. Had the prematurely deceased been still alive they would have been placing demands on health care resources, demands which have been avoided as a result of the premature deaths. This paper estimates these health care savings as well as the health care costs.

Table 17 presents estimates of drug-attributable health care costs and savings. Note that in-patient pharmaceutical costs are incorporated in hospital costs. The pharmaceutical costs identified here refer to prescribed pharmaceuticals outside the hospital system.

Table 17, Health care costs and savings resulting from drug abuse, 1998-9

	Medical $m	Hospitals $m	Nursing homes $m	Pharmaceuticals $m	Total $m
Alcohol					
Gross costs	70.6	30.5	-107.8	83.0	76.2
Savings from premature deaths	-39.7	-57.9	-58.2	7.0	-148.8
Net costs	110.3	88.3	-49.6	76.0	225.0
Tobacco					
Gross costs	490.3	718.4	792.9	248.1	2,249.7
Savings from premature deaths	280.9	409.8	412.0	52.1	1,154.8
Net costs	209.4	308.6	381.0	195.9	1,094.9
Illicit drugs					
Gross costs	51.6	57.0	5.0	4.0	117.6
Savings from premature deaths	14.9	21.7	21.8	0.0	58.4
Net costs	36.7	35.3	-16.8	4.0	59.2
All drugs					
Gross costs	612.5	805.8	690.2	335.0	2,443.5
Savings from premature deaths	256.1	373.6	375.6	59.1	1,064.5
Net costs	356.4	432.2	314.5	275.9	1,379.0

Of the total health care costs resulting from drug abuse a high proportion (80 per cent) are attributable to tobacco. This is in spite of the fact that tobacco, because it produces a much higher level of premature mortality than the other drugs, produces substantial savings from these premature deaths. Alcohol-attributable health costs represented 16 per cent of the total and illicit drug costs 4 per cent.

Great care should be taken to interpret correctly this type of information. In no way could it be claimed that, if the health care savings resulting from the premature deaths exceeded the gross health care costs, these deaths would be in the community's interest (as appeared to be the implication of the Arthur D. Little (2001) analysis of the budgetary impact of smoking in the Czech Republic). The community bears other costs as a result of premature deaths, as is clearly illustrated by later information presented on the other tangible and intangible social of drug abuse.

In the case of alcohol, the extension in life expectancies attributable to moderate alcohol consumption implies that extra health care burdens are imposed. Would anyone seriously argue that an extension of general life expectancy is against the public interest?

It has been pointed out above that interpretation of the estimates of the social costs of alcohol misuse is complicated by the existence of protective effects of alcohol consumption. The existence of both harmful and protective effects means that a relatively low aggregate cost figure could conceal the existence of very high costs related to particular conditions. Programs to reduce alcohol misuse could yield very substantial benefits even if the aggregate social costs of alcohol did not appear to be particularly high. In principle, *preventable* costs of alcohol misuse could be higher than *total* costs. Table 18 clearly illustrates the point that, in order to be able to develop rational public policies toward alcohol, aggregate alcohol costs should be disaggregated into costs caused and costs prevented.

Table 18, Alcohol-attributable deaths, hospital beddays and hospital costs, 1998-9, caused or prevented

	Deaths (number)	Hospital beddays (number)	Hospital costs ($m)
Caused	4,286	394,417	244.6
Prevented	7,029	255,443	214.1
Caused *less* prevented	-2,744	138,974	30.5

Tobacco also can have protective effects, although these are very minor in relation both to the protective effects of alcohol and to the harmful effects of smoking. This is illustrated in Table 19.

Table 19, Tobacco-attributable deaths, hospital beddays and hospital costs, 1998-9, caused or prevented

	Deaths (number)	Hospital beddays (number)	Hospital costs ($m)
Caused	19,693	984,254	728.0
Prevented	264	18,821	9.6
Caused *less* prevented	19,429	965,433	718.4

For the first time in Australia, sufficient information exists to estimate some of the costs of involuntary smoking, a term preferred by the present authors to "passive smoking" for reasons explained earlier. Estimates of the impact of involuntary smoking on deaths, hospital beddays and hospital costs, classified by age, are presented in Table 20. These results are presented in proportionate terms in Table 21.

Table 20, Tobacco-attributable deaths, hospital beddays and hospital costs, 1998-9, by age and smoking status

	Voluntary	Involuntary	Total
Deaths (number)			
0-14	0	103	103
15+	19,205	122	19,326
Total	19,205	224	19,429
Hospital beddays (number)			
0-14	0	75,311	75,311
15+	887,483	2,639	890,122
Total	887,483	77,950	965,433
Hospital costs ($m)			
0-14	0.0	45.2	45.2
15+	670.7	2.5	673.2
Total	670.7	47.6	718.4

Table 21, Proportions of tobacco-attributable deaths, hospital beddays and hospital costs, 1998-9, by age and smoking status

	Voluntary	Involuntary	Total
%	%	%	
Deaths			
0-14	0.0	45.7	0.5
15+	100.0	54.3	99.5
Total	100.0	100.0	100.0
Hospital beddays			
0-14	0.0	96.6	7.8
15+	100.0	3.4	92.2
Total	100.0	100.0	100.0
Hospital costs			
0-14	0.0	94.8	6.3
15+	100.0	5.2	93.7
Total	100.0	100.0	100.0

The above two tables clearly illustrate how the costs of involuntary smoking are largely imposed on the young. In relation to involuntary smoking, the under 15s accounted in 1998-9 for 46 per cent of attributable deaths, 97 per cent of attributable hospital bed days and 95 per cent of attributable hospital costs.

Productivity

Drug abuse causes a loss of national productive capacity in the paid work force as a result of drug-attributable death and sickness. Losses are also experienced in the unpaid workforce, that is in the household sector, from the same causes. Against these losses should be set the savings in national resources which would have been consumed had the drug-attributable deaths not occurred. Net production losses represent the gross reduction in productive capacity less these consumption savings.

Table 22 presents estimates of the reductions in productive capacity which resulted from drug abuse in 1998-9.

Of the total net production costs of $7.9 billion, tobacco accounted for by far the largest share (64.3 per cent or $5.1 billion). Alcohol represented 22.5 per cent ($1.8 billion) and illicit drugs 13.1 per cent ($1.0 billion). Of the gross production costs of $13.0 billion, workforce losses represented 41.7 per cent ($5.5 billion) and household losses 58.3 per cent ($7.6 billion).

Table 22, Paid and unpaid production costs of drug abuse, 1998-9

	Alcohol	Tobacco	Illicit drugs	Total	per cent of gross costs
	$m	$m	$m	$m	
Labour in the workforce					
Reduction in workforce					
Male	1,634.5	1,078.1	596.8		
Female	280.3	374.1	99.6		
Total reduction in workforce	1,914.8	1,452.2	696.4	4,063.3	31.0%
Absenteeism					
Male	20.0	918.7	247.6		
Female	15.2	148.6	47.2		
Total absenteeism	35.2	1,067.3	294.8	1,397.3	10.7%
Total paid production costs	1,949.9	2,519.5	991.2	5,460.7	41.7%
Labour in the household					
Premature death					
Male	595.7	3,597.3	210.3		
Female	-222.8	2,412.6	103.0		
Total premature death	372.9	6,009.9	313.3	6,696.0	51.2%
Sickness					
Male	14.6	671.6	21.9		
Female	15.0	198.6	9.7		
Total sickness	29.7	870.2	31.6	931.4	7.1%
Total unpaid production costs	402.6	6,880.0	344.8	7,627.5	58.3%
Total paid and unpaid production costs	2,352.5	9,399.6	1,336.0	13,088.1	100.0%
Consumption resources saved					
Male	658.2	3,006.4	234.6		
Female	-78.9	1,329.8	68.4		
Total consumption resources saved	579.3	4,336.2	303.0	5,218.4	
Total net production costs	1,773.2	5,063.4	1,033.1	7,869.7	
Percentage of total net production costs	22.5%	64.3%	13.1%	100.0%	

Not quantifiable: reduced on-the-job productivity

Road accidents

Table 23 below presents estimates of drug-attributable road accident costs by type of drug. The categories used are basically those adopted in the BTE estimates of aggregate road accident costs.

Table 23, Drug-attributable road accident costs, 1998-9, by type of drug

		Attributable to	
		Alcohol $m	Illicit drugs $m
Human costs			
	Medical	24.8	4.8
	Ambulance	7.6	1.5
	Hospital	20.4	6.4
	Long term care	9.6	1.9
	Labour in the workplace	307.1	56.4
	Labour in the household	21.8	69.0
	Value of life p.a.	1,272.7	64.2
	Quality of life-injuries	218.5	42.0
	Legal	155.8	30.0
	Correctional services	3.3	0.6
	Workplace disruption	60.0	11.5
	Premature funerals	0.6	0.1
	Coroner	0.2	0.0
Total human costs		2,102.5	288.5
Vehicle costs			
	Repairs	744.7	143.2
	Unavailability of vehicles	34.9	6.7
	Towing	8.2	1.6
Total vehicle costs		787.8	151.5
General costs			
	Travel delays	277.0	53.3
	Insurance administration	177.5	34.1
	Police	14.2	2.7
	Property	5.8	1.1
	Fire	1.9	0.4
Total general costs		476.3	91.6
Total costs		3,366.7	531.6
Of which			
	Tangible	1,875.5	425.4
	Intangible	1,491.3	106.3
Total n.e.i.			
	Tangible	1,274.4	245.1
	Intangible	218.5	42.0
Relevant costs as a proportion of GDP		0.43%	0.08%

Sources: BTE (2001) and authors' calculations.
Note: n.e.i. signifies not elsewhere included

Note that, in the overall output tables presented later, some of the road accident cost components above are included in other broader cost categories (for example, health or productivity). The totals above which are designated "n.e.i." are the ones carried over to the aggregate tables.

Alcohol-attributable road accidents cost an estimated $3.4 billion in 1998-9, of which 56 per cent were tangible costs. Illicit drug-attributable road accidents cost $532m. of which 80 per cent were tangible costs.

As indicated earlier, any comparison of costs and GDP should include only those categories of cost which are included in the GDP calculation. The bottom line of Table 23 makes this comparison for road accidents, thus excluding the costs of labour in the household and all intangible costs. On this basis, alcohol-attributable accident costs represented 0.43 per cent of GDP and illicit-attributable accidents 0.08 per cent.

Fires

Table 24 below presents estimates of the costs of fires resulting from smoking.

Table 24, Costs of smoking-attributable fires, 1998-9

		$m	$m
Health			
	Medical	0.6	
	Hospital	3.9	
Total health			4.5
Labour			
	In the workforce	16.4	
	In the household	4.9	
Total labour			21.3
Fire services			21.0
Property damage			5.3
Total tangible costs			52.1
Value of loss of life		28.5	
Total intangible costs			28.5
Total costs			80.6
Total tangible n.e.i.			26.3
Total intangible n.e.i.			0.0
Relevant costs as a proportion of GDP			0.02%

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

It is estimated that smoking-attributable fires cost $81m. in 1998-9, of which tangible costs represented 65 per cent and intangible costs 35 per cent.

As is also the case with road accident costs, to avoid double counting of some costs in the aggregate cost tables presented later, only some of the costs in the above table (those labelled “n.e.i.”) are carried forward to the aggregate tables.

7. Aggregate Results

Total costs

This section of the paper presents a summary of the overall social costs of drug abuse, classified by type of drug. Table 25 presents a summary of tangible costs, Table 26 presents intangible costs and Table 27 presents total costs. Note that commentary on the costs attributable to individual drugs is complicated by the joint nature of some crime costs and by the adjustment made in the All Drugs column for the interactive effects involved in the estimation of aetiological fractions for conditions attributable to more than one drug.

Table 25, Tangible social costs of drug abuse, 1998-9

	Alcohol $m	Tobacco $m	Illicit Drugs $m	All Drugs $m
Labour in the workforce				
Reduction in workforce	1,914.8	1,452.2	696.4	3,973.2
Absenteeism	35.2	1,067.3	294.8	1,366.3
Total	1,949.9	2,519.5	991.2	5,339.6
Labour in the household				
Premature death	372.9	6,009.9	313.3	6,547.5
Sickness	29.7	870.2	31.6	910.8
Total	402.6	6,880.0	344.8	7,458.3
Total paid and unpaid labour costs	2,352.5	9,399.6	1,336.0	12,797.9
Less consumption resources saved	579.3	4,336.2	303.0	5,102.7
Total net labour costs	1,773.2	5,063.4	1,033.1	7,695.2
Health care (net)				
Medical	110.3	209.4	36.7	348.5
Hospital	88.3	308.6	35.3	422.6
Nursing homes	-49.6	381.0	-16.8	307.5
Pharmaceuticals	76.0	195.9	4.0	269.8
Ambulances	-	-	5.5	5.5
Total health care	225.0	1,094.9	64.7	1,353.8
Road accidents n.e.i.	1,274.4	-	245.1	1,485.8
Fires n.e.i.	-	26.3	-	26.3
Crime n.e.i.				
Police	648.2	-	1,105.4	1,789.0
Criminal courts	112.5	-	94.0	209.2
Prisons	96.9	-	227.9	436.0
Property	n.a.	-	364.6	364.6
Productivity of prisoners	247.0	-	580.3	1,110.5
Total crime	1,104.6	-	2,372.1	3,909.3
Resources used in abusive consumption	1,164.2	1,402.1	1,392.0	3,870.4
Total	5,541.3	7,586.7	5,107.0	18,340.8
Proportion of total tangible costs	30.2%	41.4%	27.8%	100.0%

Notes: n.e.i. denotes not elsewhere included.
The sum of the individual costs of all drugs differs from the "All Drugs" total as a result of two adjustments:

- *The double counting effects of interaction on the aggregation of the individual aetiological fractions are corrected for in the "All Drugs" column.*
- *The inclusion in the total "All Drugs" crime values of costs attributable jointly to alcohol and illicit drugs (for details see Table 15). As indicated earlier, it is not possible to disaggregate these costs for attribution to individual drugs.*

Tangible costs attributable to tobacco in 1998-9 were $7.6 billion, to alcohol were $5.5 billion and to illicit drugs were $5.1 billion. Labour and health costs constituted the major cost components for both tobacco and alcohol. Crime costs comprised a very high proportion of illicit drug costs.

Table 26, Intangible social costs of drug abuse, 1998-9

	Alcohol $m	Tobacco $m	Illicit Drugs $m	All Drugs $m
Loss of life	1,800.5	13,476.3	926.8	15,844.2
Pain and suffering (road accidents)	218.5	-	42.0	254.8
Total intangible costs	2,019.0	13,476.3	968.8	16,099.0
Proportion of total intangible costs	12.5%	83.7%	6.0%	100.0%

Note: The sum of the individual costs of all drugs exceeds the "All Drugs" total as a result of adjustment for the effects of interaction on the aggregation of the individual aetiological fractions.

In relation to intangible costs, with the exception of pain and suffering of road accident victims, it was once again possible to estimate only the value of loss of life. Tobacco costs were $13.5 billion, alcohol costs $2.0 billion and illicit costs $969 million. The predominance of tobacco-attributable intangible costs is a direct result of the high level of premature mortality caused by smoking.

Table 27, Total social costs of drug abuse, 1998-9

	Alcohol $m	Tobacco $m	Illicit Drugs $m	All Drugs $m
Tangible	5,541.3	7,586.7	5,107.0	18,340.8
Intangible	2,019.0	13,476.3	968.8	16,099.0
Total	7,560.3	21,063.0	6,075.8	34,439.8
Proportion of total	22.0%	61.2%	17.6%	100.0%

Note: The sum of the individual costs of all drugs differs from the "All Drugs" total as a result of adjustment for the effects of interaction on the aggregation of the individual aetiological fractions, and because the "All Drugs" total includes some crime costs attributed jointly to alcohol and illicit drugs.

Of the total social cost of drug abuse in 1998-9 of $34.4 billion, tobacco accounted for approximately $21.1 billion, alcohol for $7.6 billion and illicit drugs $6.1 billion.

Avoidable costs

Avoidable costs represent the components of overall social costs which, according to our estimates, potentially could be eliminated if effective anti-drug policies and programs were introduced. Due to lack of appropriate data, it proved impossible to produce meaningful estimates of the avoidable component of illicit drug costs.

The next three tables present estimates of the avoidable tangible costs of alcohol and tobacco abuse, avoidable intangible costs and avoidable total costs.

Table 28, Avoidable tangible social costs of alcohol misuse and tobacco abuse, 1998-9

	Alcohol $m	Tobacco $m
Labour in the workforce		
Reduction in workforce	1,238.8	659.3
Absenteeism	30.6	442.9
Total	1,269.4	1,102.2
Labour in the household		
Premature death	241.3	2,728.4
Sickness	25.8	361.1
Total	267.1	3,089.5
Total paid and unpaid labour costs	1,536.5	4,191.6
***Less* consumption resources saved**	374.8	1,968.5
Total net labour costs	1,161.7	2,223.1
Health care (net)		
Medical	21.7	85.2
Hospital	10.2	132.5
Nursing homes	33.1	155.1
Pharmaceuticals	25.4	100.0
Ambulances		
Total health care	90.4	472.8
Road accidents n.e.i.	647.4	-
Fires n.e.i.	-	16.8
Crime n.e.i.	n.e.	n.e.
Resources used in abusive consumption	753.2	636.5
Total	2,652.7	3,349.2
Proportion of total tangible costs	47.9%	44.1%

Note: avoidable crime costs were not estimated (n.e.).

In the cases of both alcohol and tobacco, avoidable costs represent almost half of total tangible costs.

Table 29, Avoidable intangible social costs of alcohol misuse and tobacco abuse, 1998-9

	Alcohol $m	Tobacco $m
Loss of life	1,164.9	6,118.1
Pain and suffering (road accidents)	111.0	
Total intangible costs	1,275.9	6,118.1
Proportion of total intangible costs	63.2%	45.4%

Over 60 per cent of alcohol intangible costs were avoidable and approximately 45 per cent of tobacco intangible costs were avoidable, after sufficient elapsed time following the implementation of effective public policies.

Table 30, Total avoidable costs of alcohol misuse and tobacco abuse, 1998-9

	Alcohol $m	Tobacco $m
Tangible	2,652.7	3,349.2
Intangible	1,275.9	6,118.1
Total costs	3,928.6	9,467.2
Proportion of total costs	62.1%	44.9%

62 per cent of total alcohol costs and 45 per cent of total tobacco costs were avoidable.

Incidence of abuse costs

The term incidence as used here describes how the burden of drug abuse costs is split among various sections of the community (individuals, business and government). The following three tables relate only to tangible costs. Intangible costs by their nature are borne 100 per cent by individuals.

It was not possible to determine the incidence of the property losses associated with crime. It is to be expected that individuals would have borne a substantial proportion of these costs.

Neither Table 31 nor Table 33 take account of the crime-attributable costs which are attributable jointly to alcohol and illicit drugs.

Table 31, Incidence of the tangible social costs of alcohol misuse, 1998-9

	Individuals $m	Business $m	Government $m	Total $m
Workforce labour	0.0	1,597.0	352.9	1,949.9
Household labour	402.6	0.0	0.0	402.6
Hospital	3.3	16.1	68.9	88.3
Medical	11.8	6.0	92.5	110.3
Nursing homes	-9.6	-0.3	-39.7	-49.6
Pharmaceuticals	6.0	0.0	70.1	76.0
Road accidents n.e.i.	682.7	498.2	93.4	1,274.4
Crime n.e.i.	0.0	247.0	857.6	1,104.6
Resources used in abusive consumption	1,164.2	0.0	0.0	1,164.2
Total quantified tangible costs	**2,260.8**	**2,364.1**	**1,495.7**	**6,120.6**
Percentage of total quantified costs	36.9%	38.6%	24.4%	100.0%

Table 32, Incidence of the tangible social costs of tobacco abuse, 1998-9

	Individuals $m	Business $m	Government $m	Total $m
Workforce labour	0.0	2,063.5	456.0	2,519.5
Household labour	6,880.0	0.0	0.0	6,880.0
Hospital	11.4	56.4	240.8	308.6
Medical	22.3	11.4	175.6	209.4
Nursing homes	73.9	2.1	305.0	381.0
Pharmaceuticals	37.7	0.0	158.2	195.9
Fires n.e.i.	7.0	13.6	5.7	26.3
Resources used in abusive consumption	0.0	1,402.1	0.0	1,402.1
Total quantified tangible costs	**7,032.4**	**3,549.1**	**1,341.3**	**11,922.8**
Percentage of total quantified costs	59.0%	29.8%	11.3%	100.0%

Table 33, Incidence of the tangible social costs of abuse of illicit drugs, 1998-9

	Individuals $m	Business $m	Government $m	Total $m
Workforce labour	0.0	811.8	179.4	991.2
Household labour	344.8	0.0	0.0	344.8
Hospital	1.3	6.5	27.6	35.3
Medical	3.9	2.0	30.8	36.7
Nursing homes	-3.3	-0.1	-13.4	-16.8
Pharmaceuticals	0.0	0.0	4.0	4.0
Ambulances	0.0	0.0	5.5	5.5
Road accidents n.e.i.	131.3	95.8	18.0	245.1
Crime n.e.i.	0.0	580.3	1,427.2	2,007.5
Resources used in abusive consumption	0.0	1,392.0	0.0	1,392.0
Total quantified tangible costs	**478.1**	**2,888.3**	**1,679.0**	**5,045.4**
Percentage of total quantified costs	9.5%	57.2%	33.3%	100.0%

Of particular interest is the fact that the government sector bore a relatively small proportion of the tangible costs of drug abuse (24 per cent of alcohol-attributable costs, 11 per cent for tobacco and 33 per cent for illicit drugs). In all cases business bore a greater proportion of the burden (39 per cent for alcohol, 30 per cent for tobacco and 57 per cent for illicit drugs). By their nature, all intangible costs are borne by individuals.

Budgetary implications

The following three tables present estimates of the budgetary implications of drug abuse, that is of its impact upon public expenditures and revenues, at both federal and state levels. It should be noted that the estimates here relate to the budgetary impact of drug abuse, not drug consumption. Furthermore, they incorporate estimates of the revenue losses resulting from drug-induced morbidity and premature mortality. Results are presented for the overall budgetary impact of drug abuse, as well as estimates for Federal and State Governments individually for each type of drug.

Table 34, Impact of alcohol misuse on government budgets, 1998-9

Outlays	$m	$m	Receipts	$m	$m
FEDERAL GOVERNMENT					
Health			**Excise tax**		
Hospital	37.0		Beer	873.9	
Medical	92.5		Spirits	144.5	
Nursing homes	-36.8		**Total excise tax**		1,018.3
Pharmaceuticals	70.1		**Sales tax**		
Total health		162.8	Beer, wine and spirits		620.6
Road accidents n.e.i.		18.0	**Customs duties**		
			Beer	14.0	
			Wine	4.0	
			Spirits	719.0	
			Total customs duties		737.0
			Total alcohol revenue		2,375.9
			Less		
			Revenue forgone		
			Income tax	390.2	
			Indirect taxes	143.4	
			Total revenue forgone		533.6
Total outlays		180.8	**Total net revenue**		1,842.3
Net revenue minus outlays		1,661.4			
STATE GOVERNMENTS					
Health			**RRPs**		
Hospital	31.9		Beer, wine and spirits		997.4
Medical	0.0				
Nursing homes	-3.0				
Pharmaceuticals	0.0				
Total health		28.9			
Road accidents n.e.i.		75.4			
Crime n.e.i.					
Police	648.2				
Criminal courts	112.5				
Prisons	96.9				
Total crime n.e.i.		857.6			
Total outlays		962.0	**Total revenue**		997.4
Revenue minus outlays		35.4			

(continued on the next page)

(Table 34 continued)

Outlays	$m	$m	Receipts	$m	$m
ALL GOVERNMENTS					
Health			**Excise tax**		
Hospitals	68.9		Beer	873.9	
Medical	92.5		Spirits	144.5	
Nursing homes	-39.7		Total		1,018.3
Pharmaceuticals	70.1		**Sales tax**		
Total health		191.7	Beer, wine and spirits		1,618.0
Road accidents n.e.i.		93.4	**Customs duties**		
Crime n.e.i.			Beer	14.0	
Police	648.2		Wine	4.0	
Criminal courts	112.5		Spirits	719.0	
Prisons	96.9		Total		737.0
Total crime n.e.i.		857.6	**Total alcohol revenue**		3,373.3
			Less		
			Revenue forgone		
			Income tax	390.2	
			Indirect taxes	143.4	
			Total revenue forgone		533.6
Total outlays		1,142.8	**Total net revenue**		2,839.7
Net revenue minus outlays		1,696.9			

Alcohol tax revenue in 1998-9 exceeded alcohol-attributable costs borne by the public sector by $1.7 billion. Almost all of this surplus accrued to the Commonwealth Government.

Table 35, Impact of tobacco abuse on government budgets, 1998-9

Outlays	$m	$m	Receipts	$m	$m
FEDERAL GOVERNMENT					
Health			Excise tax	1,633.7	
Hospital	129.3		Customs duty	255.0	
Medical	175.6		**Total tobacco revenue**		1,888.7
Nursing homes	282.1		***Less***		
Pharmaceuticals	158.2		**Revenue forgone**		
Total health		745.2	Income tax	288.5	
Fires n.e.i.		0.0	Indirect taxes	1,073.5	
			Total revenue forgone		1,362.0
Total outlays		745.2	**Total net revenue**		526.7
Net revenue minus outlays		-218.5			
STATE GOVERNMENTS					
Health			**RRPs**		
Hospital	111.5		Excise tax	3120.2	
Medical	0.0		**Total tobacco revenue**		3120.2
Nursing homes	22.9				
Pharmaceuticals	0.0				
Total health		134.4			
Fires n.e.i.		5.7			
Total outlays		140.0	**Total revenue**		3120.2
Revenue minus outlays		2,980.2			
ALL GOVERNMENTS					
Health					
Hospitals	240.8		Excise tax	4,753.9	
Medical	175.6		Customs duty	255.0	
Nursing homes	305.0		**Total tobacco revenue**		5,008.9
Pharmaceuticals	158.2		***Less***		
Total health		879.6	**Revenue forgone**		
Fires n.e.i.		5.7	Income tax	288.5	
			Indirect taxes	1,073.5	
			Total revenue forgone		1,362.0
Total outlays		885.3	**Total net revenue**		3,646.9
Net revenue minus outlays		2,761.7			

Tobacco tax revenue in 1998-9 exceeded tobacco-attributable costs borne by the public sector by almost $2.8 billion. The beneficiaries of this surplus were State Governments. The Commonwealth's tobacco-attributable outlays exceeded its tobacco revenue by $219m.

Illicit drugs yield no tax revenue. Indeed, overall revenue is reduced as a result of illicit drug-attributable mortality and morbidity. On the other hand, substantial costs, particularly crime costs, are borne by the public sector. In 1998-9 97 per cent of net public sector outlays were borne by State Governments.

Table 36, Impact of abuse of illicit drugs on government budgets, 1998-9

Outlays	$m	$m	Receipts	$m	$m
FEDERAL GOVERNMENT					
Health			**Total revenue**		0.0
Hospitals	14.8				
Medical	30.8		**Revenue forgone**		
Nursing homes	-12.4		Income tax	142.0	
Pharmaceuticals	4.0		Indirect taxes	73.8	
Ambulances	0.0		**Total revenue forgone**		215.8
Total health		37.1			
Road accidents n.e.i.		3.5			
Total outlays		40.6	**Total net revenue**		-215.8
Net revenue minus outlays		-256.4			
STATE AND LOCAL GOVERNMENTS					
Health			**Total revenue**		0.0
Hospital	12.8				
Medical	0.0				
Nursing homes	-1.0				
Pharmaceuticals	0.0				
Ambulances	5.5				
Total health		17.2			
Road accidents n.e.i.		14.5			
Crime n.e.i.					
Police	1,105.4				
Criminal courts	94.0				
Prisons	227.9				
Total crime n.e.i.		1,427.2			
Total outlays		1,459.0	**Total revenue**		0.0
Revenue minus outlays		-1,459.0			

(continued on the next page)

Table 36 (continued)

Outlays	$m	$m	Receipts	$m	$m
ALL GOVERNMENTS					
Health			**Total revenue**		0.0
Hospital	27.6		**Revenue forgone**		
Medical	30.8		Income tax	142.0	
Nursing homes	-13.4		Indirect taxes	73.8	
Pharmaceuticals	4.0		Total revenue forgone		215.8
Ambulances	5.5				
Total health		54.3			
Road accidents n.e.i.		18.0			
Crime n.e.i.					
Police	1,105.4				
Criminal courts	94.0				
Prisons	227.9				
Total crime n.e.i.		1,427.2			
Total outlays		1,499.6	**Total net revenue**		-215.8
Net revenue minus outlays		-1,715.4			

Drug-attributable costs and gross domestic product

Estimates of aggregate drug-attributable social costs tend to produce numbers which are very large in absolute terms. This study is no exception. Commentators often attempt to put these numbers in context by expressing them as a percentage of gross domestic product (GDP), which is a measure of the total value of national production or national income. Similarly, attempts to make international comparisons of the relative sizes of aggregate drug abuse costs in economies of very different sizes (for example, Australia and the USA) tend to be made by comparing aggregate costs expressed as a percentage of GDP.

A problem with this approach is that estimates of drug abuse costs contain certain (sometimes very large) components that are not measured in conventional national account measurements of GDP. In the present study these unmeasured components consist of all intangibles (loss of life, and pain and suffering) and production losses in the household (unpaid) sector. Thus, when total drug-attributable costs are compared with GDP, like is not being compared with like.

In order to overcome this problem, Table 37 below compares GDP at factor cost (that is, not including taxes and subsidies) with only those components of drug abuse costs which are conventionally measured in national accounts data.

Table 37, Comparison of some cost categories with Gross Domestic Product, 1998-9

	Alcohol $m	Tobacco $m	Illicit Drugs $m	Alcohol % of GDP	Tobacco % of GDP	Illicit Drugs % of GDP
Labour in the workforce	1,949.9	2,519.5	991.2	0.66	0.85	0.34
Net health care	225.0	1,094.9	59.2	0.08	0.37	0.02
Road accidents n.e.i.	1,274.4	-	245.1	0.43	-	0.08
Fires n.e.i.	-	26.3	-	-	0.01	-
Crime n.e.i.	1,228.1	-	2,493.3	0.42	-	0.85
Resources used in abusive consumption	1,164.2	1,402.1	1,392.0	0.39	0.48	0.47
Total	5,841.5	5,042.8	5,180.8	1.98	1.71	1.76

Note: The crime figures do not include costs jointly attributable to alcohol and illicit drugs (for details see Table 15). These costs amounted to $574m. (0.19 per cent of GDP).

8. Future Research

In this section attention is drawn to areas of research which would permit further refinement of estimates of the social costs of drug abuse in Australia.

Epidemiology

We have already acknowledged our considerable debt to the impressive work carried out by Australian epidemiologists but, like all researchers, we want more. Gaps in our knowledge which would be of use to enable more comprehensive costing of drug abuse include :-

- Updated Arcadian normals, from the work of Professor Bruce Armstrong;
- Epidemiological work on dual diagnoses of mental health and substance abuse;
- Estimation of illicit drug aetiological fractions for assaults;
- Estimation of illicit drug aetiological fractions by type of drug;
- Further disaggregation of abusive consumption and addictive consumption of alcohol, and disaggregation by broad type of alcoholic drink (beer, wine and spirits).

Health services

The present study includes an estimate of the costs of some pharmaceuticals prescribed for drug-attributable conditions, but this is a considerable underestimate of the total costs. It would be desirable to have comprehensive studies of prescribed and across the counter pharmaceuticals for drug-attributable conditions. Data on drug-attributable primary care provision would enable more comprehensive estimates of health costs.

Non-government organisations

Services to people who are in need because of substance abuse, either their own or a family member, are provided by government and non-government agencies, but are documented only for government health and welfare provision. Non-government organizations which make a significant resource contribution, some of which are subsidised by government, should be identified and their contribution quantified.

Crime

While this is the first time we have been able to estimate drug-attributable crime, work would be further progressed with research on estimates of avoidable crime, which would enable estimates to be made of the costs of avoidable crime. Data on alcohol-attributable property crime would also permit further cost estimates. There appear to be no data available on the basis of which it would be possible to estimation the incidence of the costs of property crime (on individuals, business and government). Tobacco-attributable crime (including smuggling) is currently unquantified. Aggregate data on police detainees classified by type of crime charge are not currently published. Perhaps it might be possible for the Productivity Commission to collect these data as part of its data collection processes for its Reports on Government Services.

Welfare

It would be desirable to identify and quantify all real and pecuniary costs borne by the public welfare sector.

Litter

All three categories of drugs (alcohol, tobacco and illicit drugs) impose litter costs. However, inadequate data are currently available on the basis of which it would be possible to estimate drug-attributable litter costs.

Intangible costs

Intangible costs, which include not only morbidity and mortality but also fear, pain and suffering, do not reflect any resource use, but are an important cost of drug abuse. They are borne by drug abusers themselves, their families and the community. While intangible costs are admittedly difficult to value, further research is required to fully account for intangible costs. Judges or juries involved in determining damages awards often include a component for pain and suffering. However no details are currently presented on how this component is valued. Publication of these details would indicate community valuation of pain and suffering without, apparently, compromising the processes of justice. We recognise that estimates of the suffering of drug users and their families would result in considerably greater intangible costs.

Prescribed pharmaceuticals

Further research is necessary in order to be able to quantify the costs associated with abusive consumption of prescribed pharmaceuticals.

Bibliography

References in the following bibliography have been classified into the following categories:

- General references;
- Crime;
- Epidemiology;
- Fires
- Health;
- Litter;
- Paid and unpaid workforce;
- Road accidents;
- State cost estimates.

General references

ACIL (1994), *Smoking: Costs and Benefits for Australia*, report commissioned by the Tobacco Institute of Australia.

Alcohol and Other Drugs Council of Australia (1999), *1999-2000 Federal Budget Submission*, February.

Alcohol and Other Drugs Council of Australia (2000), *Submission to the House of Representatives Standing Committee on Family and Community Affairs Inquiry into Substance Abuse in Australian Communities*.

Anti-Cancer Council of Victoria (2000), *The Costs of Tobacco Use in the Australian Community*, Submission to the House of Representatives Standing Committee on Family and Community Affairs Inquiry into Substance Abuse in Australian Communities.

Armstrong, B.K. (1990), "Morbidity and mortality in Australia: How much is preventable?", in John McNeill *et al* (eds.), *A Handbook of Preventative Medicine,* Edward Arnold.

Australian Institute of Health and Welfare (1996b), *Tobacco Use and the Health Impact in Australia*, Canberra.

Australian Institute of Health and Welfare (1999b), *1998 National Drug Strategy Household Survey. First Results*.

Australian Institute of Health and Welfare (2000a), *Statistics on Drug Use in Australia, 1998*.

Australian Institute of Health and Welfare (2000b), *Australia's Health, 2000: the seventh biennial health report*.

Australia's National Tobacco Campaign (2000), *Evaluation Report,* Volumes 1 and 2.

Bardsley, Peter and Olekalns, Nilss (1999), "Cigarette and Tobacco Consumption: Have Anti-Smoking Policies Made a Difference?", *The Economic Record*, September.

Becker, G. and Murphy, K. (1988), "A Theory of Rational Addiction", *Journal of Political Economy*, 675-700.

Broom, J. (1999), *Ethics out of Economics*, Cambridge University Press.

Bureau of Transport Economics (1998), *The willingness to pay method for valuing road accidents*, paper prepared for the Road User Costs Steering Group, Austroads, September.

Chaloupka, Frank J. and Warner, Kenneth E. (1999), *The Economics of Smoking*, National Bureau of Economic Research Working Paper 7047.

Collins, D.J. and Lapsley, H.M. (1991), *Estimating the economic costs of drug abuse*, National Campaign Against Drug Abuse Monograph Series No. 15.

Collins, D.J. and Lapsley, H.M. (1996), *The social costs of drug abuse in Australia in 1988 and 1992*, National Drug Strategy Monograph Series No. 30.

Collins, D.J. and Lapsley, H.M. (2000), "Economic evaluation of policies and programmes: further uses of estimates of the social costs of substance abuse", *Bulletin on Narcotics*, Volume LII, Nos. 1 and 2, United Nations Drug Control Programme.

Collins, D.J.; Lapsley, H.M.; LeCavalier, J.; and Single, E. (2000), "Introduction: improving economic data to inform decisions in drug control", *Bulletin on Narcotics*, Volume LII, Nos. 1 and 2, United Nations Drug Control Programme.

Collins, D.J. and Lapsley, H.M. (2002), "The social costs and benefits of gambling: An Introduction to the Issues", *Journal of Gambling Studies*, spring/summer.

Commonwealth Department of Health and Aged Care (2001), *National Alcohol Strategy: A Plan for Action 2001 to 2003-4*, published for the National Drug Strategy.

Commonwealth Department of Family and Health Services (1998), *Patterns of drug use in Australia 1985-95*.

Commonwealth Department of Family and Community Services (2000), *Substance Abuse in Australian Communities*, Submission to the House of Representatives Standing Committee on Family and Community Affairs Inquiry, June.

Commonwealth Government Response to the Report of the Senate Committee Affairs Reference Committee, The Tobacco Industry and the Costs of Tobacco Related Illness. September 1997.

Easton, Brian (1997), "The Social Costs of Tobacco Use and Alcohol Misuse", report prepared for the Alcohol Advisory Council of New Zealand, the Health Research Council of New Zealand and the Public Health Commission, *Public Health Monograph No. 2*, Department of Public Health, Wellington School of Medicine.

Ellemann-Jensen, P. (1991), "The social costs of smoking revisited", *British Journal of Addiction*, 86

Koch, James V. and Cerula, Richard J. (1992), "Smoking, Health Costs and Public Policy", *American Journal of Economics and Sociology*, April.

Lightwood, J.; Collins, D.; Lapsley, H.; and Novotny, T.E. (2000), "Estimating the costs of tobacco use", in Jha, P. and Chaloupka, F. (eds.) (2000), *Tobacco control in developing countries*, Oxford University Press.

Little, A.D. (2001), *Public Finance Balance of Smoking in the Czech Republic.*

Ministerial Council on Drug Strategy (1999a), *National Tobacco Strategy 1999 to 2002-03. A Framework for Action*.

Ministerial Council on Drug Strategy (1999b*), Background paper. A companion document to the National Tobacco Strategy 1999 to 2002-03*, June.

National Health and Medical Research Council (1997), *The Health Effects of Passive Smoking. A Scientific Information Paper*.

National Institute on Drug Abuse and National Institute on Alcohol Abuse and Alcoholism (1999), *The Economic Costs of Alcohol and Drug Abuse in the United States – 1992*.

Price Waterhouse Coopers (1999), *The Significance of Cigarettes and Tobacco Products to Retailers. An Analysis of Retail Sales*.

Productivity Commission (1999), *Australia's Gambling Industries. Inquiry Report. Volume 1.*

Richter, B.J. and Gori, G.B. (1980), "Demographic effects of the prevention of early mortality associated with tobacco-related disease," in G.B. Gori (ed.), *A Safe Cigarette: The Banbury Report*, Cold Spring Harbor Laboratory.

Single, E.; Collins, D.; Easton, B.; Harwood, H.; Lapsley, H.; and Maynard, A. (1996), *International Guidelines for Estimating the Costs of Substance Abuse*, Canadian Centre on Substance Abuse.

Single, E.; Collins, D.; Easton, B.; Harwood, H.; Lapsley, H.; Kopp, P.; and Wilson, E (2002), *International Guidelines for Estimating the Costs of Substance Abuse-Second Edition*, Canadian Centre on Substance Abuse.

Single, Eric and Rohl, Timothy (1997), *The National Drug Strategy: mapping the future*, report commissioned by the Ministerial Council on Drug Strategy.

Steering Committee for the Review of Commonwealth/State Service Provision (various years), *Report on Government Services , Volume 1, Education, Health, Justice* and *Volume 2, Emergency Management, Community Services, Housing*.

Stevenson, R. (1994), "Harm Reduction, Rational Addiction and the Optimal Prescribing of Illegal Drugs," *Contemporary Economic Policy*, Vol. XII, July.

System of National Accounts (1993), Commission of the European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations and World Bank, New York.

United Kingdom Anti-Drugs Coordinator (1999), *First Annual Report and National Plan. Tackling Drugs to Build a Better Britain*.

United States Department of Health and Human Services (2000), *Reducing Tobacco Use. A Report of the Surgeon General*.

Williams, Paul (1997), *Progress of the National Drug Strategy: Key National Indicators.* Evaluation of the National Drug Strategy 1993-1997 Statistical Supplement.

Crime

Adhikari, Pramod and Summerill, Amber (2000), *1998 National Drug Strategy Household Survey. Detailed findings*, Australian Institute of Health and Welfare, Drug Statistics Series Number 6.

AUSTRAC (Australian Transaction Reports and Analysis Centre) (1995), *Estimates of the Extent of Money Laundering in and Throughout Australia*.

Australian National Audit Office (2002), *Administration of Tobacco Excise. Australian Taxation Office*, http://www.anao.gov.au.

Commonwealth Attorney-General's Department (2000), *Submission to the House of Representatives Standing Committee on Family and Community Affairs Inquiry into Substance Abuse in Australia*.

Australian Bureau of Criminal Intelligence*, Australian Illicit Drug Report* (various years).

Australian Customs Service (2000), *Annual Report 1999-2000*.

Bryant, Meredith and Williams, Paul (2000), "Alcohol and Other Drug-Related Violence and Non-Reporting", *Trends and issues in crime and criminal justice*, No. 171, October, Australian Institute of Criminology.

Carcach, Carlos (1997), "Reporting Crime to the Police", *Trends and issues in crime and criminal justice*, No. 68, March, Australian Institute of Criminology.

Carcach, Carlos and Grant, Anna (2000), "Imprisonment in Australia: The Offence Composition of Australian Correctional Populations, 1988 and 1998", *Trends and issues in crime and criminal justice*, No. 164, July, Australian Institute of Criminology.

Carcach, Carlos; Platen, Heike; and Makkai, Tony (undated), *Cost of drug-related crime in Australia – Draft*, Australian Institute of Criminology.

Makkai, Toni (1997), "Alcohol and Disorder in the Australian Community Part 1: Victims," *Trends and Issues in Crime and Criminal Justice*, No. 76, December, Australian Institute of Criminology.

Makkai, Toni (1998) , "Alcohol and Disorder in the Australian Community. Part 2: Perpetrators", *Trends and Issues in Crime and Criminal Justice*, No. 77, January, Australian Institute of Criminology.

Makkai, Toni (1999a), "Drugs and property crime" in Australian Bureau of Criminal Intelligence (1999).

Makkai, Toni (1999b), "Linking Drugs and Criminal Activity: Developing an Integrated Monitoring System", *Trends and Issues in Crime and Criminal Justice*, No.109, April, Australian Institute of Criminology.

Makkai, Toni (1999c), *Drug Use Monitoring in Australia (DUMA): a brief description*, Australian Institute of Criminology, Research and Public Policy Series, no 21.

Makkai, Toni (2000), "Patterns of Drug Use Amongst Police Detainees: 1999-2000", *Trends and Issues in Crime and Criminal Justice*, No 185, December , Australian Institute of Criminology.

Matthews, Sharon; Chikritzhs, Tania; Catalanos, Paul; Stockwell, Tim; and Donath, Susan (2002), "Trends in Alcohol-Related Violence in Australia, 1991-92–1999-00", *National Alcohol Indicators Bulletin*, No. 5, April, National Drug Research Institute, Perth.

Pernanen, K.; Brochu, S.; Cousineau, M.-M.; Cournoyer, L.G.; and Fu Sun (2000), "Attributable fractions for alcohol and illicit drugs in relation to crime in Canada: conceptualization, methods and internal consistency of estimates", *Bulletin on Narcotics*, Volume LII, Nos. 1 and 2, United Nations Drug Control Programme.

Pernanen, K.; Cousineau, M-M; Brochu, S.; and Fu Sun (2002), "Proportions of Crimes Associated with Alcohol and Other Drugs in Canada", Canadian Centre on Substance Abuse, www.ccsa.ca/docs/crime2002.pdf.

Perrone, Santina (2000), "Crimes Against Small Business in Australia: A Preliminary Analysis", *Trends and Issues in Crime and Criminal Justice*, No 184, November , Australian Institute of Criminology.

PriceWaterhouseCoopers (2001), *The Current Economic and Policy Environment for the Australian Tobacco Industry*, available at http://www.bata.com.au.

Stevenson, Richard J. and Forsythe, Lubica M.V. (1998), *The Stolen Goods Market in New South Wales. An interview study with imprisoned burglars*, New South Wales Bureau of Crime Statistics and Research.

Tonry, Michael and Wilson, James Q. (eds.) (1990), *Drugs and Crime*, University of Chicago Press.

Walker, John (1992), "Estimates of the costs of crime in Australia", *Trends and Issues in Crime and Criminal Justice*, No 39, August, Australian Institute of Criminology.

Walker, John (1995), "Crimes Against Businesses in Australia", *Trends and Issues in Crime and Criminal Justice*, No 45, June 1995, Australian Institute of Criminology.

Walker, John (1997), " Estimates of the Costs of Crime in Australia in 1996", *Trends and Issues in Crime and Criminal Justice*, No 72, August, Australian Institute of Criminology.

Epidemiology

Australian Institute of Health and Welfare (1999), *The burden of disease and injury in Australia*.

Australian Institute of Health and Welfare (2000), *Statistics on drug use in Australia 199*8.

Chikritzhs, T., Stockwell, T.R., Jonas, H, Stevenson, C., Cooper-Stanbury, M., Donath, S., Single, E. and Catalano, P. (2002). Towards a standardised methodology for estimating alcohol-caused death, injury and illness in Australia. *Australian and New Zealand Journal of Public Health*, 26, (5), pp. 443-450.

English, D.R., Holman, C.D.J., *et al* (1995) , *The quantification of drug caused morbidity and mortality in Australia, 1995 edition*, Commonwealth Department of Human Services and Health.

Hakulinen, T. and Teppo, L. (1976), "The increase in working years due to elimination of cancer as a cause of death", *International Journal of Cancer*, 17:429-435.

Holman C.D.J, Armstrong B.K. *et al* (1990), *The quantification of drug caused mortality in Australia 1989*, Commonwealth Department of Community Services and Health.

National Drug Research Institute (1999), "Alcohol-Caused Deaths and Hospitalisations in Australia, 1990-1997", *National Alcohol Indicators Bulletin No. 1*, December.

National Drug Research Institute (2000), "Alcohol-Caused Deaths and Hospitalisations in Australia, 1990-1997", *National Alcohol Indicators Project Technical Report No. 1*, June.

National Health and Medical Research Council (1992), *Is there a safe level of daily consumption of alcohol for men and women? Recommendations regarding responsible drinking behaviour*.

Ridolfo, Bruno and Stevenson, Chris (2001), *The quantification of drug-caused mortality and morbidity in Australia, 1998*, Australian Institute of Health and Welfare, Drug Statistics Series No. 7.

Fires

Davies, Chris (1997), "Analysis of Fire Causes on or Threatening Public Land in Victoria. 1976-77–1995-96", *Research Report No 49*, Fire Management Branch, Department of Natural Resources and Environment, Victoria, October.

Queensland Fire and Rescue Authority (2002), *Fires caused by smoking – Queensland*, (private communication). May.

Health

Australian Bureau of Statistics, *1995 National Health Survey Data Reference Package*.

Australian Institute of Health and Welfare (2000), *Australian Hospital Statistics 1998-99*, Canberra.

Bammer, G., Ostini, R. and Sengoz, A. (1995), "Using ambulance service records to examine non-fatal heroin overdoses", *Australian Journal of Public Health*;19:316-17.

Commonwealth Department of Health and Aged Care, *Annual Report 1998-99*.

Commonwealth Department of Health and Aged Care*, Medicare Statistics 1984-85 to June Quarter 2000*.

Commonwealth Department of Health and Aged Care*, Medicare Benefits Schedule Book, 1 November 2000.*

Degenhardt, Louisa, Hall, Wayne and Adelstein, Barbara-Ann (2000), "Ambulance calls to suspected drug overdoses: Analysis of New South Wales patterns July 1997 to June 1999", *National Drug and Alcohol Research Centre Technical Report No. 94.*

Dietze, Paul *et al* (2000), " Ambulance attendance at heroin overdoses in Melbourne", *Drug and Alcohol Review*, vol. 19, 1, March.

English, D.R.; Vu, T.V.H.; and Knuiman, M.W. (2002), "The impact of smoking on use of hospital services: the Busselton study", *Australian and New Zealand Journal of Public Health*, vol.26 no.3.

Health Insurance Commission, *Annual Report 1998-99*.

Health Insurance Commission, *Understanding HIC Data*.

Webster, I and Rawson, G.K. (1979), "Health status of Seventh-Day Adventists, *Medical Journal of Australia,* May 19, 1, pp.417-420.

Litter

Ecorecycle, Victorian Government Litter Research,

http://www.ecorecycle.vic.gov.au/litter/litter_research.asp.

Ecorecycle, Infrastructure Support

Grants: litter infrastructure 1997-98, Victorian Government Litter Research

http://www.ecorecycle.vic.gov.au/litter/litter_research.asp.

Keep Australia Beautiful, http://www.pc.gov.au/inquiry/49packag.chap5.pdf

August 2000.

Novotny, T.E., Zhao, F. (1999), "Consumption and production waste: another externality of tobacco use", *Tobacco Control*, 8 (1), 75-80, Spring.

Paid and unpaid workforce

Australian Bureau of Statistics (2000), *Unpaid Work and the Australian Economy 1997* (5240.0).

Bush, Robert and Wooden, Mark (1994), *Smoking, Alcohol and Absence in the Workplace: An Analysis of the 1989-90 National Health Survey*, National Institute of Labour Studies, The Flinders University of South Australia, March.

Bush, Robert and Wooden, Mark (1995), "Smoking and Absence from Work: Australian Evidence", *Social Science and Medicine*, vol. 41,3.

Parrott, Steve, Godfrey, Christine and Raw, Martin (2000), "Costs of employee smoking in the workplace in Scotland", *Tobacco Control*, June, Vol. 9 No. 2.

Webb, Gloria , Selina Redman, Deborah Hennrikus, Richard Kelman, Robert Gibberd, Robert Sanson-Fisher (1994), "Relationship between high -risk and problem drinking and the occurrence of work injuries and related absences", *Journal of Studies on Alcohol*, Vol. 55, 4.

Road accidents

Austroads Working Group (2000), *Drugs and Driving in Australia: First Report*, Austroads Publication No. AP-RXXX.

Bureau of Transport Economics (2000), *Road Crash Costs in Australia*, BTE Report 102, Canberra.

Drummer, O. (1994), *Drugs in drivers killed in Australian road traffic accidents: the use of responsibility analysis to investigate the contribution of drugs to fatal accidents*, Victorian Institute of Forensic Pathology, Department of Forensic Pathology, Monash University.

Parliament of Victoria Road Safety Committee (1996), *Inquiry into the Effects of Drugs (Other than Alcohol) on Road Safety in Victoria. Final Report Volumes One and Two*.

Watson, W. and Ozanne-Smith, J. (1997), " The cost of injury in Victoria", *Monash University Accident Research Centre, Report No 124*, Melbourne 1997.

State cost estimates

Collins, D.J. and Lapsley, H.M.(1999), *The Social Costs of Tobacco in Victoria and the Social Benefits of Quit Victoria*, Victorian Smoking and Health Program, Melbourne.

Collins, D.J. and Lapsley, H.M (2001)., *The Social Costs of Tobacco in Western Australia and the Social Benefits of Reducing Western Australian Smoking Prevalence*, Cancer Foundation of Western Australia, Monograph Series No. 1 2001.

Data sources

Adhikari, Pramod and Summerill, Amber (2000), *1998 National Drug Strategy Household Survey. Detailed findings*, Australian Institute of Health and Welfare, Drug Statistics Series Number 6.

Australian Bureau of Criminal Intelligence (various years), *Australian Illicit Drug Report*.

Australian Bureau of Statistics, *Australian National Accounts: National Income, Expenditure and Product* (5206.0).

Australian Bureau of Statistics, *Australian National Accounts: State Accounts* (5242.0).

Australian Bureau of Statistics, *Australian Demographic Statistics* (3101.0).

Australian Bureau of Statistics, *Average Weekly Earnings, States and Australia* (6302.0).

Australian Bureau of Statistics, *Causes of Death, Australia* (3303.0).

Australian Bureau of Statistics, *Company Profits, Australia* (5651.0).

Australian Bureau of Statistics, *Consumer Price Index* (6401.0).

Australian Bureau of Statistics, *Corrective Services, Australia* (4512.0).

Australian Bureau of Statistics, *Crime and Safety Australia*, (4509.0).

Australian Bureau of Statistics, *Deaths, Australia* (3302.0).

Australian Bureau of Statistics, *Distribution and Composition of Employee Earnings and Hours: Australia* (6306.0).

Australian Bureau of Statistics, *Estimated Resident Population by Sex and Age: States and Territories of Australia* (3201.0).

Australian Bureau of Statistics, *Higher Criminal Courts, Australia* (4513.0).

Australian Bureau of Statistics, *Labour Costs, Australia* (6348.0).

Australian Bureau of Statistics, *Manufacturing Industry, Australia* (8221.0).

Australian Bureau of Statistics, *Manufacturing Industry: Details of Operations, Australia* (8203.0).

Australian Bureau of Statistics, *Manufacturing Industry*, *States and Territories* (8221.1 to 8221.7).

Australian Bureau of Statistics, *Manufacturing Industry, Summary of Operations* (8202.0).

Australian Bureau of Statistics, *Measuring Unpaid Work: Issues and Experimental Estimates* (5236.0).

Australian Bureau of Statistics, *Prisoners in Australia* (4517.0).

Australian Bureau of Statistics, *Private Hospitals, Australia* (4390.0).

Australian Bureau of Statistics, *Recorded Crime*, *Australia* (4510.0).

Australian Bureau of Statistics, *Taxation Revenue Australia* (5506.0).

Australian Bureau of Statistics, *The Labour Force, Australia* (6203.0).

Australian Bureau of Statistics, *Unpaid Work and the Australian Economy, 1992. Occasional Paper*, (5240.0).

Australian Bureau of Statistics, *Unpaid Work and the Australian Economy 1997* (5240.0), 2000.

Australian Bureau of Statistics, *Working Arrangements*, catalogue no. 6342.0.

Australian Bureau of Statistics, *1995 National Health Survey Data Reference Package*.

Australian Customs Service, *Annual Reports.*

Australian Institute of Health and Welfare, *Health Expenditure Bulletin (various).*

Australian Institute of Health and Welfare (1996a), *Australia's Health 1996.*

Australian Institute of Health and Welfare (1996b), *Tobacco Use and the Health Impact in Australia*.

Australian Institute of Health and Welfare, *Health Expenditure Bulletin (various).*

Australian Institute of Health and Welfare (1999a), *The Burden of Disease and Injury in Australia – Summary Report*.

Australian Institute of Health and Welfare (1999b), *1998 National Drug Strategy Household Survey. First results*, August.

Australian Institute of Health and Welfare (2000a), *Statistics on drug use in Australia 1998*.

Australian Institute of Health and Welfare (2000b), *Australia's Health, 2000: the seventh biennial health report*.

Australian Institute of Health and Welfare (2000c), *The Burden of Disease and Injury in Australia, 1999*.

Australian Institute of Health and Welfare (2000d), *Australian Hospital Statistics 1998-99*.

Australian Institute of Health and Welfare (2000e), *1998 National Drug Strategy Household Survey. State and Territory results*.

Australian Institute of Health and Welfare (2002a), *Statistics on drug use in Australia 2000*.

Australian Institute of Health and Welfare (2002b), *2001 National Drug Strategy Household Survey. First results*, May.

Australian Taxation Office (various years), *Taxation Statistics.*

Carcach, Carlos and McDonald, David, *National Police Custody Survey August 1995*, Australian Institute of Criminology Research and Public Policy Series No. 9, 1997.

Commonwealth Department of Health and Aged Care, *Medicare Statistics 1984-85 to June Quarter 2000*.

Commonwealth Department of Health and Aged Care, *Medicare Benefits Schedule Book, 1 November 2000*.

Commonwealth Department of Health, Housing and Community Services, *Annual Reports*, Statistical Supplement.

Fitzsimmons, Gerard and Cooper-Stanbury, Mark (2000), *1998* National *Drug Strategy Household Survey. State and Territory results*, Australian Institute of Health and Welfare

Health Insurance Commission, *Annual Reports.*

Health Insurance Commission, *Understanding HIC Data*.

James Capel Australian Research, *The Australian Tobacco Sector.*

Makkai, Toni (2000), *Drug Use Monitoring In Australia (DUMA): 1999 Annual Report*, Australian Institute of Criminology Research and Public Policy Series, No. 26.

Makkai, Toni and McGregor, Kiah (2001), *Drug Use Monitoring In Australia: 2000 Annual Report on Drug Use Among Police Detainees*, Australian Institute of Criminology Research and Public Policy Series, No. 37.

Makkai, Toni and McGregor, Kiah (2002), *Drug Use Monitoring In Australia: 2001 Annual Report on Drug Use Among Police Detainees*, Australian Institute of Criminology Research and Public Policy Series, No. 41.

Miller, Megge and Draper, Glenn (2001), *Statistics on drug use in Australia 2000*, Australian Institute of Health and Welfare.

National Campaign against Drug Abuse, *National Household Surveys.*

Queensland Fire and Rescue Authority (2000), *Fires caused by smoking – Queensland (private communication)*, May.

Steering Committee for the Review of Commonwealth/State Service Provision, *Report on Government Services (*various years*), Volume 1, Education, Health, Justice* and *Volume 2, Emergency Management, Community Services, Housing*, AusInfo.

Stevenson, Richard J. and Forsythe, Lubica M.V.(1998), *The Stolen Goods Market in New South Wales. An interview study with imprisoned burglars*, New South Wales Bureau of Crime Statistics and Research.

Appendix A, Demographic estimates

Use of aetiological fractions and demographic data to estimate the additional numbers of Australian males and females who would have been alive and enumerated in the Australian population in June 1999 had there been no use of illicit drugs, alcohol or tobacco

This appendix was written by J.H. Pollard, Professor of Actuarial Studies, Macquarie University, who undertook the demographic calculations for this study.

Introduction

The results of the calculations are shown in the attached tables. In each case,

Column (1) indicates the relevant age group;

Column (2) lists the mid-year population as estimated by the Australian Bureau of Statistics;

Column (3) lists the estimated mid-year population had there been no use at any time of illicit drugs (but alcohol and tobacco were used at the same historic levels);

Column (4) lists the numbers of additional persons who would still be alive had there been no use of illicit drugs at any time; Column (4) = Column (3) - Column (2);

Column (5) lists the estimated mid-year population had there been no use of either illicit drugs or alcohol at any time (but tobacco was used at the same historic level);

Column (6) lists the numbers of additional persons who would still be alive had there been no use of alcohol at any time; Col. (6) = Col. (5)- Col. (3);

Column (7) lists the estimated mid-year population had there been no use of illicit drugs, alcohol or tobacco at any time;

Column (8) lists the numbers of additional persons who would still be alive had there been no use of tobacco at any time; Col. (8) = Col. (7) - Col. (5).

The data

The aetiological fractions used in this report are those presented in English, Holman *et al* (1995) and Ridolfo and Stevenson (2001). For the purposes of this projection, the earlier aetiological fractions are assumed to apply prior to 1988 and those of Ridolfo and Stevenson in 1998-9, with intermediate fractions for the period 1989-1997.

The other data used in the calculations are as follows:

- the population of Australia in 1947 by age (in individual years) and sex;
- the Australian life tables 1953-55, 1965-67, 1975-77, 1985-87 and 1995-97:
- the numbers of births in Australia for each calendar year 1947-1999;
- the numbers of net migrants by age (in broad age groups) and sex for representative years in each decade (1950s, 1960s, 1970s, 1980s and 1990s);
- estimates of the Australian population in 1999.

These demographic data were all available from Australian Bureau of Statistics (ABS) publications.

Method

Using the base 1947 population, the history of births, the above-mentioned life tables and the representative migration numbers, it was possible to project forward the Australian population from 1947 to 1997. The resultant estimates for 1999 were close to those provided by the ABS.

The projection program was then re-run with modifications to the assumed rates of mortality to reflect the situation which would have existed had there been (a) no illicit drug use, (b) no illicit drug use nor alcohol use, and (c) no illicit drug use, nor alcohol use nor tobacco use. The resultant figures are those shown in the tables.

All calculations were performed using single years of age. The reported results, however, have been grouped into five-year age-groups.

As in previous reports, no attempt was made to quantify the births which did not take place because of lives lost through drug usage.

Adjustment of the mortality rates

Using the aetiological fractions described above and applying them to the relevant causes of death identified by the same authors, it is possible to estimate the proportions of deaths at each age in 1992 attributable to illicit drug use, to alcohol use and to tobacco use. These proportions were then applied to the mortality rates in earlier epochs to determine the modified mortality rates for use in the various computer program runs described above. Normal multiple-decrement table formulae were used to calculate the modified rates.

This approach, applying the 1992 aetiological fractions to the 1992 deaths and then using the proportions of deaths attributable to illicit drugs, to alcohol and to tobacco in 1992 for all earlier years can be criticised on several counts. First, it is doubtful whether exactly the same fractions applied in earlier years, since usage of these drugs has changed over time, and other factors have had major impacts on the numbers dying from the various causes (road accident deaths, for example, have halved in the last decade, as a result of various measures, and circulatory system disease mortality has declined remarkably, presumably as a result of a number of lifestyle and medical changes). Second, the aetiological fractions ought to be applied to the deaths by cause in earlier epochs to derive mortality proportions relevant to those times. This second objection can be addressed, but any improvement in accuracy is likely to be spurious, because of the serious nature of the first limitation.

In the absence of equivalent aetiological fractions for all earlier epochs, the above approach was considered the most reliable.

Australian males

Age Group	Mid-Year Population	Mid-Year Population-No Illicit Drugs Abuse	Additional Population-No Illicit Drugs Abuse	Mid-Year Population-No Alcohol Misuse	Additional Population-No Alcohol Misuse	Mid-Year Population-No Tobacco Abuse	Additional Population-No Tobacco Abuse
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0	653,209	653,227	18	653,539	312	653,760	221
5	683,480	683,506	26	683,797	291	684,195	398
10	674,420	674,451	31	674,613	162	675,315	702
15	684,184	684,262	78	684,571	309	685,288	717
20	694,538	694,967	429	696,002	1,035	697,020	1,018
25	743,210	744,264	1,054	746,552	2,288	747,701	1,149
30	704,477	706,045	1,568	709,498	3,453	711,049	1,551
35	752,176	754,337	2,161	759,230	4,893	761,126	1,896
40	708,715	710,981	2,266	716,605	5,624	719,116	2,511
45	665,185	667,376	2,191	673,647	6,271	677,147	3,500
50	612,443	614,385	1,942	620,907	6,522	625,915	5,008
55	466,560	467,956	1,396	473,495	5,539	480,360	6,865
60	378,484	379,466	982	384,514	5,048	396,573	12,059
65	331,820	332,502	682	337,289	4,787	358,221	20,932
70	289,711	290,132	421	293,775	3,643	326,116	32,341
75	213,195	213,390	195	214,317	927	253,449	39,132
80	110,502	110,570	68	108,745	-1,825	140,539	31,794
85	74,189	74,226	37	68,569	-5,657	106,020	37,451
Total	9,440,498	9,456,043	15,545	9,499,665	43,622	9,698,910	199,245

Australian females

Age Group	Mid-Year Population	Mid-Year Population-No Illicit Drugs Abuse	Additional Population-No Illicit Drugs Abuse	Mid-Year Population-No Alcohol Misuse	Additional Population-No Alcohol Misuse	Mid-Year Population-No Tobacco Abuse	Additional Population-No Tobacco Abuse
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0	619,341	619,345	4	619,346	1	619,385	39
5	648,955	648,964	9	648,975	11	649,162	187
10	642,684	642,701	17	642,739	38	643,215	476
15	649,996	650,047	51	650,143	96	650,658	515
20	666,400	666,559	159	666,810	251	667,560	750
25	736,261	736,541	280	737,046	505	737,910	864
30	707,857	708,225	368	709,018	793	710,167	1,149
35	754,850	755,351	501	756,535	1,184	757,884	1,349
40	711,564	712,099	535	713,501	1,402	715,170	1,669
45	663,412	663,952	540	665,560	1,608	667,511	1,951
50	592,602	593,112	510	594,929	1,817	597,126	2,197
55	450,906	451,309	403	453,025	1,716	455,479	2,454
60	378,897	379,214	317	380,800	1,586	384,900	4,100
65	346,233	346,459	226	347,838	1,379	354,769	6,931
70	329,170	329,318	148	330,030	712	341,189	11,159
75	282,267	282,359	92	281,595	-764	296,930	15,335
80	178,091	178,132	41	174,866	-3,266	189,646	14,780
85	166,804	166,821	17	152,524	-14,297	174,751	22,227
Total	9,526,290	9,530,508	4,218	9,525,280	-5,228	9,613,412	88,132

Australian total

Age Group	Mid-Year Population	Mid-Year Population-No Illicit Drugs Abuse	Additional Population-No Illicit Drugs Abuse	Mid-Year Population-No Alcohol Misuse	Additional Population-No Alcohol Misuse	Mid-Year Population-No Tobacco Abuse	Additional Population-No Tobacco Abuse
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0	1,272,550	1,272,572	22	1,272,885	313	1,273,145	260
5	1,332,435	1,332,470	35	1,332,772	302	1,333,357	585
10	1,317,104	1,317,152	48	1,317,352	200	1,318,530	1,178
15	1,334,180	1,334,309	129	1,334,714	405	1,335,946	1,232
20	1,360,938	1,361,526	588	1,362,812	1,286	1,364,580	1,768
25	1,479,471	1,480,805	1,334	1,483,598	2,793	1,485,611	2,013
30	1,412,334	1,414,270	1,936	1,418,516	4,246	1,421,216	2,700
35	1,507,026	1,509,688	2,662	1,515,765	6,077	1,519,010	3,245
40	1,420,279	1,423,080	2,801	1,430,106	7,026	1,434,286	4,180
45	1,328,597	1,331,328	2,731	1,339,207	7,879	1,344,658	5,451
50	1,205,045	1,207,497	2,452	1,215,836	8,339	1,223,041	7,205
55	917,466	919,265	1,799	926,520	7,255	935,839	9,319
60	757,381	758,680	1,299	765,314	6,634	781,473	16,159
65	678,053	678,961	908	685,127	6,166	712,990	27,863
70	618,881	619,450	569	623,805	4,355	667,305	43,500
75	495,462	495,749	287	495,912	163	550,379	54,467
80	288,593	288,702	109	283,611	-5,091	330,185	46,574
85	240,993	241,047	54	221,093	-19,954	280,771	59,678
Total	18,966,788	18,986,551	19,763	19,024,945	38,394	19,312,322	287,377

Appendix B, Method of estimation of drug-attributable cases

This appendix was written by Dr James Codde, Director, Epidemiology and Analytical Services, Department of Health, Western Australia..

Mortality data

National mortality data for the calendar years 1998-2000 were obtained from the Australian Bureau of Statistics (ABS). From these data, those records where the date of death fell between 1 July 1998 and 30 June 1999 were extracted. This ensured that fatalities that occurred during the study period but were subject to lengthy coronial inquest were included.

In 1999, the ABS changed the method of coding the cause of death from ICD-9 to ICD-10. Mortality records where the cause of death was one attributable to alcohol, tobacco or other drugs were identified using a set of codes based on ICD-9 or ICD-10 as appropriate (see Tables B1 to B3). For those records coded in ICD-10, the extra cause of death codes were used if appropriate.

Morbidity data

De-identified data for all public and private hospital discharges that occurred in Australian between 1 July 1998 and 30 June 1999 were obtained from the Australian Institute of Health and Welfare (AIHW) after receiving permission from each State and Territory.

Of the data received, some records were coded using ICD-9-CM whilst others were based on ICD-10-AM depending upon the state of origin (WA, SA and NT were ICD-9-CM). Records originally coded using ICD-9-CM were also mapped to ICD-10-AM by the AIHW for grouping to AR-DRG Version 4.0. For the purposes of this study however, the original set of codes was used to identify those records with a drug-caused condition as shown in Tables B1 to B3.

Estimation of drug-attributable cases

Mortality and hospital morbidity records identified as having a cause of death or principal diagnosis as being attributable to either, alcohol, tobacco or other drugs were extracted. The number of cases attributable to drug usage was determined after multiplication by the age, gender and condition specific aetiologic fraction.

Using this derived fraction of cases, the number of potential years of life lost was estimated from the death data using the method of Hakulinen and Teppo (1976)[1] .

Similarly, the drug-caused fraction of beddays and hospital costs was determined from application of aetiologic fractions to the age and gender specific data. The cost information was based on the national public cost data for AR-DRG Version 4.1 as supplied by AIHW.

---

1 *Hakulinen T, Teppo L. (1976). The increase in working years due to elimination of cancer as a cause of death. Int J Cancer. 17:429-435.*

Table B1: Causes of death and principal diagnoses identified as alcohol-related conditions

Condition	ICD-9 code	ICD10 code
Cancer		
Oropharyngeal cancer	141,143-146,148-149	C01-C06, C09-C10, C12-C14
Oesophageal cancer	150	C15
Liver cancer	155	C22
Laryngeal cancer	161	C32
Female breast cancer	174	C50
Alcoholism and alcoholic liver cirrhosis		
Alcoholic psychosis	291	F10.3-F10.9
Alcohol dependence/abuse	303,305.0	F10-F10.2
Alcoholic liver cirrhosis	571.0–571.3	K70
Road injuries	E810–E819	V02.1, V02.9, V03.1, V03.9, V04.1, V04.9, V09.2, V09.9, V12-V14, V19.4-V19.6, V20-V28, V29.4-V29.6, V30-V38, V39.4-V39.6, V40-V48, V49.4-V49.6,V50-V58, V59.4-V59.6, V60-V68, V69.4-V69.6, V70-V78, V79.4-V79.6, V80.3-V80.5, V81.1, V82.1, V83.0-V83.3, V84.0-V84.3, V85.0-V85.3, V86.0-V86.3, V87.0-V87.8, V89.2, V89.4-V89.9[c]
Other		
Epilepsy	345	G40-G41
Alcoholic poly-neuropathy	357.5	G62.1
Hypertension	401–405	I10-I15
Ischaemic heart disease	410–414	I20-I25
Alcoholic cardiomyopathy	425.5	I42.6
Supraventricular cardiac dysrhythmias	427.0,427.2, 427.3	I47.1, I47.9-I48.9
Heart failure	428–429	I50
Stroke	430–438	I60-I69.9, G45
Oesophageal varices	456.0–456.2	I85, I98.2
Gastro-oesophageal haemorrhage	530.7	K22.6
Alcoholic gastritis	535.3	K29.2
Unspecified liver cirrhosis	571.5–571.9	K74.3-K74.6
Cholelithiasis	574	K80
Pancreatitis, acute and chronic	577.0, 577.1	K85, K86.0–K86.1
Low birthweight	656.5, 764, 765	O36.5, P04.2, P05, P07
Psoriasis	696.1	L40.0-L40.4, L40.8-L40.9
Ethanol/methanol toxicity	980.0, 980.1[a]	T51.0-T51.1[a]
Alcoholic beverage poisoning	E860.0[b]	T51.0-T51.1 and (X45, X65 or Y15[c])[b]
Other ethanol and methanol poisoning	E860.1,E860.2, E860.9[b]	-
Fall injuries	E880–E888	W00-W19[c]
Fire injuries	E890–E899	X00-X09[c]
Drowning	E910	W65-W74[c]
Aspiration	E911	W78-W79[c]
Occupational and machine injuries	E919, E920	W24-W31[c]
Suicide and self-inflicted injury	E950–E959	X60-X84, Y87.0[c]
Assault	E960, E965, E966, E968, E969	Age>14y and X85-Y09, Y87.1[c]
Child abuse	E967	Age<15y and X85-Y09, Y87.1[c]

(a) Diagnosis code used only for calculating numbers of drug-caused hospital separations and patient days.
(b) External cause code used for calculating numbers of drug-caused deaths and PYLL.
(c) Codes commencing with W, X or Y are external cause codes used for calculating deaths or hospital discharges.

Table B2: Causes of death and principal diagnoses identified as tobacco-related conditions

Condition	ICD-9 code	ICD10 code
Cancer		
Oropharyngeal cancer	141, 143–146, 148–149	C01-C06, C09-C10, C12-C14
Oesophageal cancer	150	C15
Stomach cancer	151	C16
Anal cancer	154.2, 154.3	C21
Pancreatic cancer	157	C25
Laryngeal cancer	161	C32
Lung cancer	162	C33-C34
Endometrial cancer	179, 182	C54-C55
Cervical cancer	180, 233.10	C53, D06
Vulvar cancer	184.4	C51.8-C51.9
Penile cancer	187.1–187.4	C60
Bladder cancer	188	C67
Renal parenchymal cancer	189.0	C64
Renal pelvic cancer	189.1	C65
Respiratory carcinoma in situ	231	D02
Ischaemic heart disease		
Ischaemic heart disease	410–414	I20-I25
Chronic obstructive pulmonary disease		
Chronic obstructive pulmonary disease	490–492, 496	J40-J44
Other direct effects of smoking		
Tobacco abuse	305.1	F17, T65.2, Z72.0
Parkinson's disease	332	G20-G21
Pulmonary circulation disease	415.0, 416–417	I26-I28
Cardiac dysrhythmias[a]	427	I46-I49
Heart failure[a]	428–429	I50-I51, I97.1
Stroke	430–438	I60-I69, G45
Atherosclerosis	440–448	I70-I79, M30-M31
Pneumonia	480–487	J10-J18, A48.1
Peptic ulcer	531–534	K25-K28
Crohn's disease	555	K50
Ulcerative colitis	556	K51
Ectopic pregnancy	633, 761.4	O00
Spontaneous abortion	634, 761.8	O03
Antepartum haemorrhage	640, 641, 762.0, 762.1	O20, O44.1, O45-O46, O67,P02.0-P02.1
Hypertension in pregnancy	642, 760.0	O10-O11, O13-O16
Low birthweight	656.5, 764, 765	O36.5, P04.2, P05, P07
Premature rupture of membranes	658.1–658.2, 761.1	O42, O75.6

(continued)

Table B2 (continued): Causes of death and principal diagnoses identified as alcohol-related conditions

Condition	ICD-9 code	ICD10 code
SIDS (and smoking during pregnancy)	798.0	R95
Fire injuries	E890–E899	X00-X09[b]
Involuntary smoking		
Lung cancer	162	C33-C34
Ischaemic heart disease	410–414	I20-I25
Asthma (under 15 years)	493	J45, J46
Lower respiratory illness (under 18 months)	464, 466, 480–486, 487 & 490	J04, J05, J10-J18, J20-J22 & J40-J44
SIDS (and post natal smoking)	798.0	R95

(a) The majority of heart failure and cardiac dysrhythmias are secondary to ischaemic heart disease.
(b) Codes commencing with W, X or Y are external cause codes used for calculating death or hospital discharges.

Table B3: Causes of death and principal diagnoses identified as illicit drug-related conditions

Condition	ICD-9 code	ICD10 code
Directly attributable to opiates		
Opiate dependence	304.0, 304.7	F11.2-F11.4
Opiate abuse	305.5	F11.0-F11.1
Opiate poisoning	965.00, 965.01, 965.02[a]	T40.0-T40.3[a]
Accidental [d] opiate poisoning	E850.0, E850.1[b]	T40.0-T40.3 and (X42 or Y12[c])[b]
Antepartum haemorrhage due to opiates	640, 641, 762.0, 762.1	O20, O44.1, O45-O46, O67,P02.0-P02.1
Low birthweight due to opiates	764, 765, 656.5	P05, P07
Directly attributable to other illicit drugs		
Cannabis dependence	304.3	F12.2-F12.4
Cannabis abuse	305.2	F12.0-F12.1
Amphetamine dependence	304.4	F15.2-F15.4
Amphetamine abuse	305.7	F15.0-F15.1
Cocaine dependence	304.2	F14.2-F14.4
Cocaine abuse	305.6	F14.0-F14.1
Psychostimulant poisoning	969.7[a]	T43.6[a]
Accidental [d] poison by psychostimulants	E854.2[b]	T43.6 and (X41 or Y11[c])[b]
Hallucinogen dependence	304.5	F16.2-F16.4
Hallucinogen abuse	305.3	F16.0-F16.1
Hallucinogen poisoning	969.6[a]	T40.7-T40.9[a]
Other psychotropic drug poisoning	969.8, 969.9[a]	T43.8-T43.9[a]
Accidental [d] poisoning by hallucinogens	E854.1[b]	T40.7-T40.9 and (X42 or Y12[c])[b]
Anabolic steroid poisoning	962.1[a]	T38.7[a]
Antepartum haemorrhage due to cocaine	640, 641, 762.0, 762.1	O20, O44.1, O45-O46, O67,P02.0-P02.1
Low birthweight due to cocaine	764, 765, 656.5	P05, P07
Attributable to unclassifiable injecting drug use		
Hepatitis B	070.2, 070.3	B16, B18.0-B18.1
Hepatitis non A, and B	070.4, 070.5	B17.1-B17.8
AIDS	279.1, 042–044	B20-B24, R75, Z20.6, Z21
Infective endocarditis	421	I33
Other related causes		
Drug psychoses	292	F11-F19 as FX.5-FX.9
Maternal drug dependence	648.3	O35.5
Newborn drug toxicity	760.7, 779.5	P04.4, P96.1
Road injuries	E810–E819	V02.1, V02.9, V03.1, V03.9, V04.1, V04.9, V09.2, V09.9, V12-V14, V19.4-V19.6, V20-V28, V29.4-V29.6, V30-V38, V39.4-V39.6, V40-V48, V49.4-V49.6,V50-V58, V59.4-V59.6, V60-V68, V69.4-V69.6, V70-V78, V79.4-V79.6, V80.3-V80.5, V81.1, V82.1, V83.0-V83.3, V84.0-V84.3, V85.0-V85.3, V86.0-V86.3, V87.0-V87.8, V89.2, V89.4-V89.9[c]
Suicide	E950–E959[b]	X60-X84, Y87.0[c] [b]

(a) Diagnosis code used only for calculating numbers of drug-caused hospital separations and patient days.
(b) External cause code used only for calculating numbers of drug-caused deaths and PYLL.
(c) Codes commencing with W, X or Y are external cause codes used for calculating death or hospital discharges.
(d) Accidental poisoning includes those of undetermined intent

Appendix C, Aetiological fraction estimates of drug-related crime

This appendix was written by Paul Williams, Manager, Public Policy and Drugs Program, Australian Institute of Criminology

Introduction

The concept and process of estimating aetiological fractions or attributable risk are been discussed in detail by the authors of the present publication (see Section 2 above and Collins and Lapsley, 1991, 1996).

The present study draws on the work of Pernanen, Cousineau, Brochu and Sun (2002) in their study of Canadian offenders. Pernanen and his colleagues adopted Goldstein's earlier (1985) tripartite framework of causal pathways of drug use to crime:

- *Psychopharmacological* – drugs act directly on the brain, or indirectly via particular personality traits to induce behaviours, including antisocial and criminal behaviours, which would not have occurred in the absence of drugs;
- *Economic compulsive* – drug dependency results in the exhaustion and outstripping of sources of legitimate income, compelling addicted persons to derive income from illegitimate sources; and
- *Systemic* – crimes committed for the establishment, operation and protection of drug distribution markets.

The data used for in this study are from the Australian Institute of Criminology's Drug Use Careers of Offenders (DUCO) project, a random sample survey of 2,135 sentenced adult male inmates in four jurisdictions.

Methodology

Based on inmates' current most serious offence (MSO) and self attribution for why offences were committed, separate estimates of each of the first two of Goldstein's three pathways were initially constructed and then a combined model which corrected for overlaps between the two was produced to give a two-factor model. Three aspects of drug use/MSO were considered.

- Were inmates intoxicated at the time of committing MSOs?
- Were inmates addicted at the time of committing MSOs?
- What reasons were given by inmates for committing MSOs?

Current most serious offence was provided by corrections authorities and matched to questionnaire data after completion of the survey. Intoxication and addiction status was determined by self-report. Reasons for committing the current most serious offence for which inmates were incarcerated were open-ended qualitative items. Preliminary analysis of the responses indicated, in general, nine categories of responses. All responses were then independently assigned to these categories by three researchers. Inter-rater concordance was 80.54% and agreement among at least two coders was 96.02%.

As occurred in the Canadian study, systemic offences were difficult to detect in DUCO. In the former study estimates of the impact had they been included in the aetiological fractions were in the order of +1% to +2%. In a separate analysis of the impact of alcohol or drugs on lifetime offences (as opposed to current most serious offence) in the current study, just 0.2% of inmates offered systemic reasons. Accordingly, we have not attempted to modify the final Australian model to allow for any possible systemic component. The two-factor model results in 13 mutually exclusive intoxication/addiction typologies across eight different offence categories. These are aggregated to produce three final aetiological fractions: offences due to illicit drug only, offences due to alcohol only and offences due to a combination of illicit drugs and alcohol.

Most serious offence

Over half the inmates (57.4%) were currently serving a sentence which included a conviction for a most serious offence of violence (Table C1). Slightly less than one in five (18.2%) was serving a sentence which included a conviction for property offences.

Table C1, Current most serious offence

	(% of inmates)
Violent	57.4
Property	18.2
Drug offences	7.4
Traffic	6.2
Breaches	3.7
Disorder	0.7
Drink driving	2.0
Other	4.1
Unknown	0.3
Total	100.0

Source: Australian Institute of Criminology DUCO unit record computer file

Psychopharmacological estimates

Over half the inmates (58.0%) were intoxicated at the time of committing the most serious offence for which they were incarcerated (Table C2).

About one in five (22.6%) inmates reported being 'high' at the time of committing their most serious offence, one in six (19.5%) were drunk at the time of committing their most serious offence and one in five (15.9%) were both 'high and drunk'.

Table C2, Intoxication status at time of most serious offence

	(%)
High only	22.6
Drunk only	19.5
High and drunk	15.9
Neither	42.0
Total	100.0

Source: Australian Institute of Criminology DUCO unit record computer file

When stratified by eight offence categories, 54% of violent crimes are attributable to alcohol and/ or illicit drug intoxication, 66% of property crimes, 54% of drug specific crimes (e.g. use, possess, deal/traffic, grow/manufacture), 64% of traffic offences, 64% of breaches of justice orders, 50% of disorder offences, 86% of driving under the influence (DUI), and 69% of other offences (Table C3).

Table C3, Raw Intoxication model (1) by offence status

	Violent	Property	Drug	Traffic	Breaches	Disorder	DUI	Other	Raw fractions
High only	16.1	36.3	43.9	22.0	24.1	12.5	4.7	27.3	**22.6**
Drunk only	20.4	13.7	3.2	34.8	24.1	25.0	65.1	13.6	**19.5**
High and drunk	17.2	16.2	6.4	6.8	15.2	12.5	16.3	28.4	**15.9**
Raw fractions	**53.7**	**66.2**	**53.5**	**63.6**	**63.4**	**50.0**	**86.1**	**69.3**	**58.0**
No substance	46.3	33.8	46.5	36.4	36.6	50.0	13.9	30.7	42.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Australian Institute of Criminology DUCO unit record computer file

Perhaps not surprisingly, drug-specific offence inmates were the most likely to report being 'high' at the time of committing offences (43.9%) and driving under the influence inmates were most likely to report being drunk at the time of committing offences (65.1%).

Corrected for self-attribution for why they committed their most serious offence however, the first level attributable fractions diminish considerably (Table C4). That is, a minority of the inmates who reported being intoxicated at the time of their offence also reported that the reason they offended was *because* they were intoxicated.

Table C4, Corrected intoxication model (2) – committed offence *because* intoxicated, by offence status

	Violent	Property	Drug	Traffic	Breaches	Disorder	DUI	Other	Attrib fractions
High only	1.3	1.3	0.0	1.5	1.3	0.0	0.0	3.4	**1.2**
Drunk only	7.4	2.7	0.0	12.7	7.6	0.0	4.8	5.7	**6.1**
High and drunk	4.4	3.4	0.6	3.0	5.5	0.0	2.3	3.7	**3.8**
Fractions	**13.1**	**7.4**	**0.6**	**17.2**	**14.4**	**0.0**	**7.1**	**12.8**	**11.1**
No substance	86.9	92.6	99.4	82.8	85.6	100.0	92.9	87.2	88.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Australian Institute of Criminology DUCO unit record computer file

Just 11% of all offences were attributed to being intoxicated, 13% of violent offences, 7% of property offences, less than 1% of drug offences, 17% of traffic offences, 14% of breaches of justice orders, 0% of disorder offences, 7% of driving under the influence and 13% of other offences, attributed to the intoxication effects of alcohol, drugs or both alcohol and drugs.

Some inmates who were intoxicated at the time of their most serious current offence did not sufficiently articulate the relationship between their intoxication status and committing offences. They merely reported that it was alcohol or drug related, without reference to intoxication or addiction factors. We therefore separately estimate the impact of these

reasons to ensure that all possible offences, notwithstanding the non-articulation, are accounted for (Table C5). The possibility that unarticulated reasons are more appropriately apportioned to economic compulsive motives is corrected for in the final model (16) below.

Table C5, Corrected intoxication model (3) – intoxicated and reason for offence was non-specific alcohol or drug related, by offence status

	Violent	Property	Drug	Traffic	Breaches	Disorder	DUI	Other	Attrib fraction
High only	6.7	13.8	23.2	6.8	8.9	6.3	0.0	5.7	**9.1**
Drunk only	4.8	0.8	0.0	2.4	6.3	12.5	4.8	5.7	**3.7**
High and drunk	5.0	2.9	2.6	1.5	1.4	6.3	9.3	12.4	**4.4**
Fractions	**16.5**	**17.5**	**25.8**	**10.7**	**16.6**	**25.0**	**14.1**	**23.7**	**17.2**
No substance	83.5	82.5	74.2	89.3	83.4	75.0	85.9	76.3	82.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Australian Institute of Criminology DUCO unit record computer file

Under model (3) a further 17% of all offences were attributed to alcohol and/ or illicit drugs intoxication, 16% of violent offences, 17% of property offences, 16% of drug offences, 11% of traffic offences, 17% of breaches of justice orders, 25% of disorder offences, 24% of driving under the influence, and a further 14% of other offences, attributed to intoxication reasons.

Models (2) and (3) are mutually exclusive and therefore they can be aggregated to produce final psychopharmacological fractions (Table C6).

Table C6, Additive (2+3) intoxication model (4) by offence status

	Violent	Property	Drug	Traffic	Breaches	Disorder	DUI	Other	Attrib fraction
High	8.0	15.1	23.2	8.3	10.1	6.3	0.0	9.1	**10.4**
Drunk	12.3	3.5	0.0	15.0	14.0	12.5	9.6	11.3	**9.8**
High and drunk	9.3	6.3	3.2	4.5	6.9	6.3	11.6	16.0	**8.2**
Fractions	**29.6**	**24.9**	**26.4**	**27.9**	**31.0**	**25.0**	**21.3**	**36.5**	**28.4**
Not an addict	70.4	75.1	73.6	72.1	69.0	75.0	78.7	63.5	71.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Australian Institute of Criminology DUCO unit record computer file

Over one in four offences (28%) are attributable under the psychopharmacological framework, with 30% of violent offences, 25% of property offences, 26% of drug offences, 28% of traffic offences, 31% of breaches of justice orders, 25% of disorder offences, 21% of driving under the influence and 37% of other offences due to being intoxicated.

Economic compulsive estimates

Independent of the intoxication status, inmates were asked if they were addicted to any substance at the time of committing their most serious offence for which they were

incarcerated (Table C7). Approximately half (54%) indicated they were addicted to illicit drugs (34.0%), alcohol (10.6%) or both alcohol and illicit drugs (9.6%).

Table C7, Raw addiction model (5) by offence status

	Violent	Property	Drug	Traffic	Breaches	Disorder	DUI	Other	Raw attrib fraction
Illicit drugs only	28.5	48.7	47.1	31.1	35.4	12.5	7.0	42.0	**34.0**
Alcohol only	12.0	7.2	2.5	12.9	10.1	6.3	27.9	11.4	**10.6**
Illicit drugs and alcohol	9.9	10.3	6.4	6.1	10.1	6.3	14.0	11.4	**9.6**
Raw fractions	**50.5**	**66.2**	**56.0**	**50.1**	**55.6**	**25.1**	**48.9**	**64.8**	**54.2**
Not an addict	49.5	33.8	44.0	49.9	44.4	74.9	51.1	35.2	45.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Australian Institute of Criminology DUCO unit record computer file

Half the violent offence inmates (51%) were addicted to alcohol and/ or illicit drugs, 66% of property offenders, 56% of drug offenders, 50% of traffic offenders, 56% of breach of justice orders, 25% of disorder offenders, 49% of driving under the influence offenders and 65% of other offenders were addicted at the time of committing their most serious offence.

As with the psychopharmacological fractions, these estimates are corrected for self-attribution for the reasons for committing the offences (Table C8). Just 7% of the inmates who were addicted indicated an economic compulsive reason attached to their addiction, for committing their current most serious offence. Property offenders (10.1%) were most likely to report an economic compulsive illicit drug addiction-related reason and drink drivers (2.3%) were most likely to report an economic compulsive alcohol addiction-related reason.

Table C8, Corrected addicted model (6) – committed offence because addicted, by offence status

	Violent	Property	Drug	Traffic	Breaches	Disorder	DUI	Other	Attrib fraction
Illicit drugs only	5.0	10.1	4.5	0.0	6.3	0.0	0.0	9.1	**5.6**
Alcohol only	0.1	1.1	0.6	0.0	0.0	0.0	2.3	0.0	**0.3**
Illicit drugs and alcohol	1.2	1.4	0.6	0.0	1.3	0.0	0.0	0.0	**1.0**
Fractions	**6.3**	**12.5**	**5.7**	**0.0**	**7.6**	**0.0**	**2.3**	**9.1**	**7.0**
Not an addict	93.7	87.5	94.3	100.0	92.4	100.0	97.7	94.3	96.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Australian Institute of Criminology DUCO unit record computer file

As with the psychopharmacological fractions, a number of inmates who were addicted at the time of committing their most serious offence did not sufficiently articulate the relationship between their addiction status and reasons for committing offences. Instead, they indicated that they committed the offences for alcohol and/ or drug related reasons without mentioning intoxication or addiction factors. Again, to ensure that all possible offences where addiction was a factor are included, we estimate fractions for the non-specific articulations (Table C9). As occurred with the non-specific intoxication 'alcohol/drug related' fractions we correct for the possibility that these offences should be more appropriately apportioned elsewhere, in the final model (16) below.

Table C9, Corrected economic compulsive model (7) – addicted and reason for offence non-specific alcohol or drug related, by offence status

Addiction status	Violent	Property	Drug	Traffic	Breaches	Disorder	DUI	Other	Attrib fraction
Illicit drugs only	10.6	17.6	24.8	9.9	12.6	12.5	7.0	10.2	**12.8**
Alcohol only	2.6	0.3	0.0	0.8	2.5	6.3	2.3	6.3	**2.0**
Illicit drugs and alcohol	2.6	1.1	1.3	0.8	0.0	0.0	4.7	4.6	**2.3**
Fractions	15.7	19.0	26.1	11.4	15.2	18.8	14.0	21.1	16.9
Not an addict	84.3	81.0	73.9	88.6	84.8	81.2	86.0	78.9	83.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Australian Institute of Criminology DUCO unit record computer file

A further 17% of offences were attributed to alcohol and /or drugs under the non-specific alcohol or drug related addiction attribution model, with 16% of violent offences, 19% of property offences, 26% of drug offences, 11% of traffic offences, 15% of breaches of justice orders, 19% of breaches, 14% of driving under the influence offences and 21% of other offences, attributed to economic compulsive reasons.

As with the psychopharmacological estimates the economic compulsive models (6) and (7) are mutually exclusive and can be aggregated (Table C10).

Table C10, Additive (6 + 7) economic compulsive model (8) by offence status

Addiction status	Violent	Property	Drug	Traffic	Breaches	Disorder	DUI	Other	Attrib fraction
Illicit drugs only	15.6	27.7	29.3	9.9	19.0	12.5	7.0	19.3	**18.5**
Alcohol only	2.7	1.3	0.6	0.8	2.5	6.3	4.6	6.3	**2.3**
Illicit drugs and alcohol	3.8	2.4	1.9	0.8	1.3	0.0	4.7	4.6	**3.1**
Fractions	22.0	31.5	31.8	11.4	22.8	18.8	16.3	30.2	23.9
Not an addict	78.0	68.5	68.2	88.6	77.2	81.2	83.7	69.8	79.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Australian Institute of Criminology DUCO unit record computer file

Just under 24% of all offences are attributable to economic compulsive reasons, with 22% of violent offences, 32% of property offences, 32% of drug offences, 11% of traffic offences, 23% of breaches of justice orders, 19% of disorder offences, 16% of driving under the influence and 30% of other offences attributable to addiction to alcohol and/ or illicit drugs.

Combined psychopharmacological/economic compulsive estimates

There are inmates who were both intoxicated and addicted at the time of committing their most serious offence. The additive models (4) and (8) above are not mutually exclusive, and hence there will be overlaps (i.e. double counting). Accordingly, it is necessary to correct for this. Combining intoxication status and addiction status at the time of committing the most

serious offence produces 13 drug-related status typologies (Table C11). They range from being neither high nor drunk, nor addicted to alcohol or illicit drugs at the time of committing a most serious offence through to being both high and drunk and being addicted to both alcohol and illicit drugs.

Table C11, Intoxication and addiction typologies

1	Not high or drunk, not an addict
2	High only, not an addict
3	High only, and an illicit addict
4	High only, and an alcohol addict
5	High only, and both alcohol and illicit addict
6	Drunk only, not an addict
7	Drunk only, and an illicit addict
8	Drunk only, and an alcohol addict
9	Drunk only, and both alcohol and illicit addict
10	High and drunk, not an addict
11	High and drunk, and an illicit addict
12	High and drunk, and an alcohol addict
13	High and drunk, and both alcohol and illicit addict

Source: Australian Institute of Criminology DUCO unit record computer file

When these typologies are applied to the eight offence categories 58% of inmates were either high or drunk or both high and drunk, or addicted to alcohol or illicit drugs or addicted to both alcohol and illicit drugs, at the time they committed their most serious current offence (Table C12). Drink driving MSO inmates (86%) reported the highest levels of intoxication/addiction and disorder MSO inmates reported the lowest levels (50%).

Table C12, Combined intoxication/addiction status model (9) by offence status

Intoxication/ Addiction category	Violent	Property	Drug	Traffic	Breaches	Disorder	DUI	Other	Raw attrib fraction
1	46.3	33.8	46.5	36.4	36.7	50.0	14.0	30.7	41.9
2	2.5	2.6	9.6	3.8	3.8	6.3	2.3	2.3	3.2
3	12.7	32.5	31.8	15.2	17.7	6.3	2.3	25.0	18.3
4	0.0	0.0	0.0	1.5	1.3	0.0	0.0	0.0	0.1
5	0.8	1.3	2.5	1.5	1.3	0.0	0.0	0.0	1.0
6	9.5	5.7	1.3	20.5	12.7	12.5	34.9	4.5	9.3
7	1.1	1.0	0.0	3.8	2.5	0.0	0.0	0.0	1.1
8	8.4	5.7	1.9	9.1	7.6	6.3	25.6	8.0	7.7
9	1.5	1.3	0.0	1.5	1.3	6.3	4.7	1.1	1.4
10	3.9	4.6	1.3	0.0	3.8	6.3	4.7	4.5	3.7
11	5.3	4.6	3.8	2.3	3.8	6.3	4.7	11.4	5.1
12	1.5	0.8	0.0	1.5	1.3	0.0	0.0	2.3	1.3
13	6.4	6.2	1.3	3.0	6.3	0.0	7.0	10.2	5.9
Raw fractions	**53.6**	**66.3**	**53.5**	**63.7**	**63.4**	**50.3**	**86.2**	**69.3**	**58.1**
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Australian Institute of Criminology DUCO unit record computer file

These raw fractions still require correcting for attribution of intoxication/ addiction as reasons for committing the offences, as occurred with the earlier separate psychopharmacological and economic compulsive models. That is, the raw fractions require adjusting for:

- the proportion of intoxicated inmates attributing *intoxication* as the reason for committing MSOs;
- the proportion of addicted inmates attributing *addiction* as the reason for committing MSOs; and
- the proportion of intoxicated or addicted inmates attributing a *non-specific* alcohol and/ or illicit drug related reason for committing MSOs.

Table C13, Corrected combined intoxication/addiction model (10) – psychopharmacological attribution, by offence status

Intoxication/ Addiction category	Violent	Property	Drug	Traffic	Breaches	Disorder	DUI	Other	Attrib fraction
2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
3	0.8	1.3	0.0	1.5	1.3	0.0	0.0	3.4	1.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	3.4	0.5	0.0	7.1	2.5	0.0	0.0	2.3	2.7
7	0.3	0.3	0.0	2.3	1.3	0.0	0.0	0.0	0.4
8	3.2	1.9	0.0	3.3	3.8	0.0	2.3	3.4	2.7
9	0.5	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.3
10	1.0	0.3	0.0	0.0	1.9	0.0	2.4	0.0	0.7
11	0.8	1.0	0.6	0.8	0.0	0.0	0.0	2.3	0.8
12	0.8	0.3	0.0	0.8	1.3	0.0	0.0	0.0	0.6
13	1.8	1.9	0.0	1.5	2.5	0.0	0.0	1.1	1.6
Fractions	**13.1**	**7.4**	**0.6**	**17.2**	**14.6**	**0.0**	**7.0**	**12.5**	**11.1**

Source: Australian Institute of Criminology DUCO unit record computer file

Across all offence categories 11.1% of offences are attributable to a psychopharmacological cause (i.e. 11.1% of inmates were positive to an intoxication and/ or addiction indicator and they reported that they committed MSOs *because* they were intoxicated) (Table C13). Conversely, this result can be expressed as – just under nine in ten offences are *not* attributable to psychopharmacological reasons. Traffic MSO inmates (17.2%) were most likely to fit a psychopharmacological profile and disorder MSO inmates (0%) were least likely.

Table C14, Corrected combined intoxication/addiction model (11) – economic compulsive attribution, by offence status

Intoxication/ Addiction category	Violent	Property	Drug	Traffic	Breaches	Disorder	DUI	Other	Attrib fraction
2	0.3	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.3
3	2.9	7.8	4.5	0.0	5.1	0.0	0.0	6.8	3.9
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
6	0.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.1	0.8	0.6	0.0	0.0	0.0	2.3	0.0	0.3
9	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.1	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.2
11	0.6	0.5	0.0	0.0	1.3	0.0	0.0	1.1	0.5
12	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1
13	0.6	0.8	0.0	0.0	1.3	0.0	0.0	0.0	0.5
Fractions	**5.1**	**12.0**	**5.1**	**0.0**	**7.6**	**0.0**	**2.3**	**8.0**	**6.2**

Source: Australian Institute of Criminology DUCO unit record computer file

Just 6% of all offences are attributable to economic compulsive reasons (i.e. 6% of inmates were positive to an intoxication and/ or addiction indicator and they reported that they committed MSOs *because* they needed money for their alcohol/ illicit drug addictions (Table C14). Conversely, this result can be expressed as – over nine in ten offences are *not* attributable to economic compulsive reasons. Property MSO inmates (12%) were most likely to fit an economic compulsive profile and disorder MSO inmates (0%) were least likely.

Across all offence categories 17.2% of offences are attributable to a non-specific alcohol or drug related reasons (i.e. 17.2% of inmates were positive to an intoxication and/ or addiction indicator and they reported that they committed the MSO *because* of a non-specific alcohol or drug-related reason) (Table C15). Conversely, this result can be expressed as – over four in five offences are *not* attributable to non-specific alcohol and/ or drug related reasons. Drug MSO inmates (26%) were most likely to fit a non-specific alcohol or drug related profile and traffic MSO inmates (11%) were least likely.

Table C15, Corrected combined intoxication economic compulsive model (12) – attribution 'alcohol or drug related', by offence status

Intoxication/ Addiction category	Violent	Property	Drug	Traffic	Breaches	Disorder	DUI	Other	Attrib fraction
2	0.6	0.0	2.7	0.0	0.0	0.0	0.0	1.1	0.6
3	5.8	13.8	19.1	6.8	8.9	6.3	0.0	4.6	8.3
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.3	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.3
6	1.9	0.3	0.0	1.6	3.8	6.3	2.5	1.1	1.6
7	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.2
8	2.3	0.0	0.0	0.8	2.5	6.3	2.3	4.6	1.8
9	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1
10	1.0	0.8	0.0	0.0	0.0	0.0	0.0	1.5	0.8
11	1.9	1.3	2.5	0.8	1.3	6.3	4.7	4.6	1.9
2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.2
13	1.9	0.8	0.0	0.8	0.0	0.0	4.7	4.5	1.5
Fractions	**16.3**	**17.4**	**25.6**	**10.8**	**16.5**	**25.2**	**14.2**	**24.3**	**17.2**

Source: Australian Institute of Criminology DUCO unit record computer file

As with the separate psychopharmacological and economic compulsive models, the three combined models (10-12) are mutually exclusive and can be aggregated to obtain the final model (Table C16).

Table C16, Additive intoxication/addiction model (13), by offence status

Intoxication/ Addiction category	Violent	Property	Drug	Traffic	Breaches	Disorder	DUI	Other	Attrib fraction
2	1.4	0.5	2.7	0.0	0.0	0.0	0.0	1.2	1.2
3	9.4	22.9	23.5	8.4	15.2	6.3	0.0	14.8	13.1
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.6	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.5
6	5.4	1.4	0.0	8.7	6.4	6.3	2.5	3.4	4.4
7	0.7	0.5	0.0	2.3	1.3	0.0	0.0	0.0	0.6
8	5.6	2.7	0.6	4.1	6.3	6.3	7.0	8.0	4.8
9	0.8	0.3	0.0	0.0	0.0	0.0	2.4	0.0	0.5
10	2.0	1.8	0.0	0.0	1.9	0.0	2.4	1.5	1.7
11	3.2	2.8	3.2	1.5	2.5	6.3	4.7	8.0	3.3
12	1.0	0.5	0.0	0.8	1.3	0.0	0.0	2.3	0.9
13	4.3	3.5	0.0	2.3	3.8	0.0	4.7	5.7	3.7
Fractions	**34.5**	**36.9**	**31.3**	**28.0**	**38.6**	**25.2**	**23.5**	**44.7**	**34.5**

Source: Australian Institute of Criminology DUCO unit record computer file

Across all offence categories 34.5% of offences are attributable to either psychopharmacological, economic compulsive or non-specific alcohol or drug-related attributions (i.e. 34.5% of inmates were positive to an intoxication and/ or addiction indicator and they reported that they committed the MSO *because* of one of the alcohol or drug-related reasons). Conversely, this result can be expressed as – about two thirds of

offences are *not* attributable to alcohol and/ or illicit drugs. Property MSO inmates (37%) were most likely to fit an aetiological fraction profile and traffic MSO inmates (11%) were least likely.

The final step in estimating drug-related crime aetiological fractions using these data is to aggregate the alcohol only, illicit drugs only and combined effect alcohol and drug attributions (Table C17). Because the estimates are based on a sample of inmates and not a complete census they are subject to sampling error (that is, the extent to which the sample may vary from all sentenced male inmates). Accordingly, 95% confidence intervals are provided for information. For example, while the overall aetiological fraction for alcohol and/ or illicit drugs is estimated to be 34.5% we are 95% confident that the 'true' fraction lies somewhere between 32.5% and 36.6%.

Table C17, Summary corrected additive psychopharmacological/economic compulsive model (14), by offence status

MSO	Drug					
	Illicit drugs only	Alcohol only	Illicit drugs and alcohol	Final fractions	95% Confidence intervals	Not Alcohol or illicit drugs
Violent	10.8	11.0	12.6	34.5	31.8-37.1	65.5
Property	23.4	4.1	9.4	36.9	32.1-41.7	63.1
Drug	26.3	0.6	4.4	31.3	24.1-38.6	68.7
Traffic	8.4	12.8	6.8	28.0	20.3-35.6	72.0
Breaches	15.2	12.7	10.8	38.6	27.9-49.3	61.4
Disorder	6.3	12.6	6.3	25.2*	3.9-46.4	74.8
Drink driving	0.0	9.5	14.1	23.5*	10.9-36.2	76.5
Other	15.9	11.4	17.4	44.7	34.4-55.1	55.3
Fractions	**14.2**	**9.1**	**11.2**	**34.5**	**32.5-36.6**	**65.5**
95% Confidence intervals	12.7-15.7	7.9-10.3	9.9-12.5	32.50-36.54		

Source: Australian Institute of Criminology DUCO unit record computer file

** Relative standard error greater than 25% and less than 50% - interpret with caution*

The final model (14) estimates that 14.2% of all offences are due to illicit drugs (alone), 9.1% are due to alcohol (alone) and 11.2% of offences are due to a combination of alcohol and illicit drugs. Over one third of all violent and over one third of all property offences are due to alcohol and/ or illicit drugs.

Discussion

There are two dominant considerations in attempting to estimate how much crime is caused by drugs when using sample surveys: reliability and validity. As a general comment, results presented here may not be generalisable to all offenders or offences. Incarceration is an option of last resort. Many offences are not reported; many offences which are reported do not result in offenders being identified; many identified offenders are not charged; not all charges result in convictions; and not all convictions result in custodial sentences. The

incarcerated population is therefore the 'sharp end' of a much larger pyramidical hierarchy of offending and offenders.

Reliability

The estimates are based on the most serious offence for which inmates received their current custodial sentence. The extent to which motivations for these offences represent a general pattern of motivations for all offences (regardless of detection, conviction) is unknown. Even among respondents to DUCO, when asked about the impact that drugs and alcohol had on their entire offending careers, there is a noticeable and significant departure from attributions for committing their most serious current offence (refer to Williams, Rushforth and Morris, 2002).

The DUCO sample was also drawn from only four jurisdictions; Queensland, Western Australia, Tasmania, and the Northern Territory. The larger population states, New South Wales and Victoria, and females and juveniles in all jurisdictions were not represented. The extent to which the incarcerated male population in the four participating jurisdictions vary in drug use and criminal activity from the non-sampled populations is also unknown.

Validity

Results are based on self-report and, *prima facie*, there would be doubt as to the honesty and accuracy of memory in recalling motivations for offences which occurred, in some cases, many years in the past. The usual steps of cross-validation measures which are employed in similar surveys among difficult populations were adopted to ensure as far as possible, that accurate responses were reported. A total of 53 inmates' responses (or 2.4% of all completions) were rejected *in toto* during quality control.

However, caution should still be observed in interpreting results. For example, *a priori*, it might be expected that 100% of driving under the influence of alcohol offences would be identifiable as psychopharmacologically 'in scope' for the purposes of the present study. Just one in ten drink driving respondents indicated the cause of committing the offence was alcohol intoxication (solely) and a further one in eight indicated the cause was a combination of alcohol and illicit drugs intoxication. That is, about four in five driving under the influence MSO inmates did not attribute the cause of their offence to intoxication. Indeed, further analyses undertaken but not reported here, indicates that the vast majority of these inmates attributed their primary motivation to rational/instrumental reasons (e.g. I needed to get some smokes, so I drove, didn't I?).

Summary

A possible approach to be adopted in interpreting the results is if we accept that:

- the incarcerated male populations in the four participating jurisdictions *are* representative of the whole incarcerated Australian population; and
- it is *necessary* that being addicted and/ or being intoxicated is an entry level requirement; and
- it is *necessary* that the addiction/intoxication condition be the primary motivating factor for specific crimes (MSOs); and
- these factors represent a wider general pattern of causes for all offences…

then we estimate that about one third of offences are causally related to alcohol or illicit drug use and addiction.

An alternative cautious approach is to interpret the results as fractions which might be applied for most serious offences only, among the incarcerated adult male population.

References

Collins, D.J. and Lapsley, H.M. (1991), *Estimating the economic costs of drug abuse in Australia*, National Campaign Against Drug Abuse Monograph Series No. 15.

Collins, D.J. and Lapsley, H.M. (1996), *The social costs of drug abuse in Australia in 1988 and 1992*, National Drug Strategy Monograph Series No. 30.

Goldstein, P.J. (1985), "The drugs/violence nexus: A tripartite conceptual framework", *Journal of Drug Issues*, vol. 15, pp. 493-506.

Pernanen, K.; Cousineau, M.-M.; Brochu, S.; and Fu Sun (2002), "Proportions of Crimes Associated with Alcohol and Other Drugs in Canada", Canadian Centre on Substance Abuse.

Acknowledgement

The Drug Use Careers of Offenders (DUCO) study is funded under the National Illicit Drugs Strategy via the Commonwealth Attorney General's Department.

Appendix D, Drugs and crime: calculating attributable fractions from the DUMA project

This appendix was written by Toni Makkai and Kiah McGregor, Australian Institute of Criminology.

Acknowledgments

There are a range of partners in the DUMA project. We would like to acknowledge the data collection agencies — Edith Cowan University, Hauritz & Associates, Walsh & Associates and Forsythe Consultants Pty Ltd. The Queensland, New South Wales, South Australian and Western Australian Police Services provide 'in-kind' support and invaluable assistance to the project. Funding for the first three years of the project was from the National Illicit Drug Strategy. Current funding is provided by Commonwealth Attorney Generals and SA Attorney Generals. Neither the funding agencies, collectors nor the police services bear any responsibility for the analyses or interpretations presented here.

Introduction

Calculating national attributable fractions for the amount of crime that is drug related requires data that are not currently available in Australia. The data would need to have the following characteristics:

- National data on the total number of detainees and offences committed in Australia;
- Capacity to determine whether each individual offence was due to the person being intoxicated;
- Capacity to determine whether each individual offence was due to the person's drug dependency.

Many people assume that such data can be derived from administrative data sources such as police crime statistics. The limitations of this type of data have been highlighted elsewhere (see Makkai, 1999; Carcach, 1997; Carcach and Makkai, 2002; Pernanen, Cousineau, Brochu and Sun, 2002). This is compounded by measurement issues of intoxication and dependency (see Makkai, 2002; Pernanen, Cousineau, Brochu and Sun, 2002). There is currently no reliable drug test for illicit substances that can determine levels of intoxication (see Poysner, Makkai, Norman and Mills, 2002) or dependency. Current collections rely solely on self-report data from individuals about their own condition. There have been a number of studies in criminology that have shown discrepancies between self-reported use and drug testing results amongst police detainees and incarcerated detainees (Harrison and Hughes, 1997; Committee on Data and Research for Policy on Illegal Drugs, 2001). However, in general, social scientists regard self-reported drug use as a reasonable and reliable methodology for collecting information on drug use and offending behaviour.

There are essentially three models or ideal types that are used to explain the *causal* links between drugs and crime (see Pernanen, Cousineau, Brochu and Sun, 2002):

1. Psychopharmacological – this postulates that the person was intoxicated and the intoxication resulted in antisocial and criminal behaviour. This requires data on the level of intoxication at the time of offending and evidence that the intoxication *caused* the behaviour.
2. Economic compulsive – this postulates that the person has a drug dependency problem that 'compelled' the person to commit crimes to support their drug habit. Again this model requires that a *causal* link be demonstrated.
3. Systemic – the crimes result from engagement in 'drug market' activity such as establishing and maintaining an illicit drug market or drug-defined crimes.

Model 1 is usually applied to violent and disorderly behaviour most notably in the case of alcohol and stimulants such as amphetamines and cocaine.

Model 2 is usually applied to property crime most notably in the case of heroin and other illicit substances, but not usually alcohol or cannabis.

Model 3 involves two components – offending behaviour associated with a drug market and drug-defined crimes. The former is not of relevance to estimating attributable fractions as this requires a *causal* component (see Pernanen, Cousineau, Brochu and Sun, 2002, p. 82 for more detailed discussion). For the latter, drug defined crimes have been attributed a fraction of 100 percent on the basis that the crime would not have occurred if the activity had been defined as legal.

There are complications with these models. A person may commit an armed robbery to acquire money for a drug dependency problem yet armed robbery is classified as a violent offence. Police arrest people for a wide range of infractions of the law that these theories do not cover. For example, driving without a licence or a breach of bail conditions. Determining the extent to which 'crime' is drug related is complex and requires data at such a level of specificity that it may never be possible to collect in total. The data presented here have a number of limitations, some of which are discussed below. The AIC will be producing a monograph in 2003 that examines in greater detail the links between drug use and crime from a variety of data sources.

Data source: DUMA

The data used in this paper come from the Drug Use Monitoring in Australia (DUMA) project (see Makkai and McGregor, 2002). DUMA has been in operation since 1999. Additional sites were added in 2002 and throughout the first three years of the pilot phase various changes were made to the questionnaire. As a result, the key questions of causality and dependency are only available from quarter 2 in 2001. The sample used for this work comes from quarter 3, 2001 to quarter 2, 2002, effectively providing a sample for the financial year 2001-2002. Taking into account some missing data on some of the variables results in an effective sample of 1,782 police detainees. To ensure that data were collected from the same sites for every quarter over this period, only the data from Bankstown, Parramatta, East Perth and Southport are used. Although these watchhouses/police stations process large volumes of detainees relative to other sites within their jurisdictions they are clearly not representative of watchhouses/police stations across the country. Analyses of the Australian Institute of Criminology's census of persons detained in custody in 1995 identified 466 stations or watchhouses where persons could be detained.

The DUMA sample results from interviews conducted in the same watchhouses approximately every three months. Interviewers are in the watchhouses usually around 12 out of the 24 hour period over a three week period – there are variations from site to site.

During the time frames the interviewer attempts to approach all persons who have been detained in the past 48 hours. Analyses of response rate data indicate that around 80 percent of those approached agree to an interview. It is possible for the same person to be interviewed more than once throughout a 12 month period. However, as no names are collected it is not possible to determine accurately how often this occurs. It impossible to determine if the offending profile of detainees matches the national profile of detainees at this time. The AIC is currently in the process of arranging a national census of police detainees that will allow this issue to be addressed. As already mentioned, the analyses here also rely on the self-reported data on both drug use and offending history.

Measuring offending

There are two measures of offending – the number of offenders and the number of offences. The latter is much larger than the former as offenders typically commit more than one offence. The calculations in this paper are based on the offender not on the charges. Criminological research has consistently demonstrated that drug-using offenders report higher rates of offending than non-drug using offenders (see Makkai, 2002). As a result these figures will under-estimate the total volume of crime that is drug-related.

Furthermore, increasingly police are issuing 'street' level cautions or notices to appear in court which do not involve bringing people to the police station or watchhouse. As a result the DUMA sample is likely to be skewed towards the more serious crimes.

Type of offending

Charges are coded according to the ABS Australian Standard Offence Classification system. As there are hundreds of offences, for ease of interpretation these have been collapsed into 8 categories – violent, property, drug offences, driving under the influence, traffic offences, disorder, breaches and other offences. A most serious offence hierarchy, which ranges from violent to other offences, has been calculated. The decision was made to take into account all arrests reported over the past 12 months, not just the most current offence. Thus the measure is for the most serious offence in the past 12 months. Potentially this overcomes the problem of relying on one arrest occasion as a measure of the 'typical' offending profile. There is no attempt to weight the seriousness of crimes.

Measuring intoxication with DUMA data

If a person has used a drug it does not automatically mean that the person intoxicated, although clearly use is a prerequisite for intoxication. The DUMA study does not ask detainees if they were intoxicated at the time of arrest; it asks if they had been using any drugs at the time of arrest. Similarly detainees are asked if they were using alcohol at the time of the arrest but not whether they were intoxicated. Both of these measures are problematic but they are the best available and are used as surrogates for intoxication. In all likelihood they overestimate the level of intoxication, particularly for alcohol.

Measuring dependency

Dependency is a clinical term that is difficult to measure outside a clinical setting.

Furthermore, there has been relatively little work on validating standard dependency assessment tools amongst police detainees. Dependency has been defined as 'a cluster of physiological, behaviour and cognitive phenomena of variable intensity in which the use of a psychoactive drug (or drugs) takes on a high priority (Ghodse, 1995: 3). DUMA asks detainees whether they felt they needed or were dependent on [drugs] in the past 12 months. This is a simple attribution question.

As this analysis is not seeking to attribute dependency to any particular drug a measure was calculated for each detainee who attributed dependency to those drugs that they said they had tried illegally – cannabis, cocaine, opiates (including heroin/morphine), street methadone, amphetamine (including methamphetamine), benzodiazepines, ecstasy and hallucinogens. The question was also asked for alcohol and a separate measure was calculated.

Measuring causation

There is no measure or even approximation for causal behaviour for alcohol. In terms of illicit drugs, detainees are asked to indicate in the past 12 months how many of their offences were drug related. They were specifically told to exclude alcohol. They were presented with five possible responses – all of it, most of it, about half of it, some of it and none of it. Previous experience with asking detainees to provide more detailed information, such as in percentage terms, resulted in unreliable data. The most liberal estimate is taken by assuming that if the detainee indicated some or more of their offending was drug related they were assumed to be drug related.

Developing the attributable fractions

Stage 1: illicit drugs

Table D1 indicates that 40 percent of detainees said they felt dependent on one or more illicit drugs (cannabis, cocaine, opiates, street methadone, amphetamines, benzodiazepines, ecstasy or hallucinogens) in the past 12 months. Thirty-six percent attributed some or more of the offending in the past 12 months to illicit drugs (excluding alcohol). When both dependency and causation are taken into account, 25 percent of detainees said they were dependent and attributed some or more of their offending to drugs in the past 12 months.

As already mentioned it is possible for a person to not have a dependency problem but to commit offences because of intoxication. For example, amphetamine use could result in aggressive behaviour leading to an arrest. The surrogate measure of intoxication is whether they reported using drugs just prior to their arrest – this activity was reported by 41 percent of the detainees. When this is adjusted for causation (not all persons who become intoxicated commit crimes) 22 percent of detainees fit this category.

Table D1, Proportions dependent, intoxicated and causal attribution – illicit drugs

		Percentage
1.	Dependent	40
2.	Attributed some or all offending to illicit drugs	36
3.	(Dependent and attributed offending to illicit drugs)	(25)
4.	Using at time of arrest	41
5.	(Using and attributed offending to illicit drugs)	(22)

Source: Australian Institute of Criminology, DUMA collection [Computer File]

It is possible for detainees to fit into both models (3 and 5), effectively resulting in double counting. To account for this possibility detainees were assigned to four possible categories – no causal attribution of offending behaviour to drugs (70 percent of the detainees) while 30 percent attributed some or more of their offending to drug use. This group can be divided into 17 percent who attributed causation and were also both dependent and using at the time of arrest. Five percent were using at the time of offence and their offending was drug related and a further 8 percent had felt dependent at some point in the past 2 months and also attributed some or more of their offending to drugs over this same period.

Table D2, Adjusting for double counting

	Percentage
No attribution	70
Attributed some or all offending to illicit drugs	30
Dependent and attributed offending to illicit drugs	8
Using and attributed offending to illicit drugs	5
Both dependent and using and attributed offending to illicit drugs	17

Source: Australian Institute of Criminology, DUMA collection [Computer File]

Stage 2: alcohol

There are only two measures for alcohol – the proportion who reported they were dependent (13 percent) and the proportion who reported using alcohol just prior to their arrest (27 percent). As there is no measure of how much offending was 'caused' by alcohol a lower bound estimate was calculated – the detainee had to be both dependent and report use at the time of arrest. This resulted in 7 percent of detainees.

Table D3, Alcohol use amongst police detainees

	Percentage
Dependent	13
Using at time of arrest	27
Both dependent and using at time of arrest	7

Source: Australian Institute of Criminology, DUMA collection [Computer File]

Stage 3: combining drugs and alcohol

It is possible for a person to be counted in both Tables D2 and D3 – that is they use both alcohol and illicit drugs. A summary measure adjusting for the double counting was developed. Two sets of estimates are provided. The lower bound uses the 7 percent of dependent alcohol users who were using at the time of arrest. The upper bound estimates are for those who report using at the time of arrest with no adjustments for dependency. For the lower bound estimates (Table D4a) 29 percent of detainees were classified as either dependent or intoxicated and attributing some or more of their offending to drug use (category 1), 6 percent were only dependent on alcohol and using alcohol at the time of the arrest (category 2) and 2 percent were in both the alcohol and illicit drugs categories (category 3). Overall 64 percent of detainees did not fall into one of the above (category 4).

Table D4a, Combining illicit drugs and alcohol – lower bound estimates

		Percentage
1.	Illicit drugs	29
2.	Alcohol	6
3.	Both	2
4.	None of the above	64

Source: Australian Institute of Criminology, DUMA collection [Computer File]

For the upper bound estimates the proportion using alcohol increases substantially to 21 percent (category 2) and the other estimates are adjusted downwards.

Table D4b, Combining illicit drugs and alcohol – upper bound estimates

		Percentage
1.	Illicit drugs	25
2.	Alcohol	21
3.	Both	6
4.	None of the above	48

Source: Australian Institute of Criminology, DUMA collection [Computer File]

Stage 4: drug related offending by type of offence for persons

The proportions calculated in Tables D4a and D4b can be used to provide attributable fractions by the person's offending profile. There are two important points to note. The first is that the offender profile is based on the most serious offence (MSO) over a twelve-month period. This may skew an offender's profile to the more serious end of the offending scale. The second is that the data are based on the person and not on arrests. In total this sample self-reported 7,242 arrests in the past 12 months.

Tables D5a and D5b present the results using the lower and upper bound estimates developed above. The differences between the two estimates suggest little overlap between alcohol and illicit drugs and offending. However, further work on this issue is required.

Table D5a, Attributable fractions by most serious charge in past 12 months – upper bound estimates

	Violent	Property	Drugs	Drink Driving	Traffic	Disorder	Breaches	Other
	%	%	%	%	%	%	%	%
Illicit drugs	22	38			14	5	13	8
Alcohol	23	9			12	55	26	27
Both	8	6			3	4	3	2
(Any)	(53)	(53)	(100)	(100)	(29)	(64)	(41)	(37)
None of the above	47	47			71	36	59	63

Source: Australian Institute of Criminology, DUMA collection [Computer File]

Table D5b, Attributable fractions by most serious charge in past 12 months – lower bound estimates

	Violent	Property	Drugs	Drink Driving	Traffic	Disorder	Breaches	Other
	%	%	%	%	%	%	%	%
Illicit drugs	27	43			17	9	16	8
Alcohol	7	2			2	15	5	4
Both	3	1			0	0	0	2
(Any)	(37)	(46)	(100)	(100)	(19)	(24)	(21)	(14)
None of the above	63	54			81	76	79	86

Source: Australian Institute of Criminology, DUMA collection [Computer File]

Conclusion

This analysis has used data from the Drug Use Monitoring in Australia project to calculate the proportion of detainees whose offending could be 'causally' linked to illicit drugs and alcohol. The limitations of the data have been identified throughout the report and should be kept in mind when using or applying these data to the whole of the offender population. The lower bound estimate is 37 percent and the upper bound estimate is 52 percent for police detainees. Based on Canadian research Pernanen, Cousineau, Brochu and Sun (2002) suggest the range of 40 to 50 percent for the more serious crimes generally. For the subcomponent, based on police interviews with arrestees, they calculate an estimate of 57 percent. However, they highlight that as the data rely on police officer's assessments of intoxication it is highly likely that the figure is an overestimate of the relationship. DUMA relies on the detainee's self-report and the information is elicited from an independent interviewer who is not attached to the police.

References

Carcach, C. (1997), 'Reporting crime to the police', *Trends and Issues in Crime and Criminal Justice,* no 68, Australian Institute of Criminology, Canberra.

Carcach, C. and Makkai, T., (2002), *Review of Victoria Police Crime Statistics*, Report to the Chief Commissioner, Victoria Police, October.

Committee on Data and Research for Policy on Illegal Drugs (2001), *Informing America's Policy on Illegal Drugs: What We Don't Know Keeps Hurting Us*, Committee on Law and Justice and Committee on National Statistics, National Research Council.

Ghodse, Hamid (1995), *Drugs and Addictive Behaviour: A Guide to Treatment*, second edition, Cambridge University Press.

Harrison, Lana and Hughes, Arthur (eds.) (1997), *The Validity of Self-Reported Drug Use: Improving the Accuracy of Survey Estimates*, US Department of Health and Human Services, National Institutes of Health, NIDA Research Monograph 167.

Makkai, Toni (1999), 'Linking Drugs and Criminal Activity: Developing an Integrated Monitoring System', *Trends & Issues in Crime and Criminal Justice,* no. 109, Canberra: Australian Institute of Criminology.

Makkai, Toni (2002) 'Illicit Drugs and Crime' in Graycar, Adam and Grabosky, Peter (eds.) (2002), *Cambridge Handbook of Australian Criminology*, Cambridge University Press.

Makkai, Toni and McGregor, Kiah (2002), 'Drug Use Monitoring in Australia (DUMA): 2001 Annual Report on Drug Use Among Police Detainees' *Research and Public Policy Series*, no 41, Canberra: Australian Institute of Criminology.

Pernanen, K; Cousineau M.; Brochu S.; and Sun F. (2002), *Proportions of crimes associated with alcohol and other drugs in Canada*, Canadian Centre on Substance Abuse.

Posyer, Carmel; Makkai, Toni; Norman, Louise; and Mills, Leesa (2002), *Drug Driving Among Police Detainees in Three States of Australia*, Report to the National Drug Law Enforcement Research Fund, April.